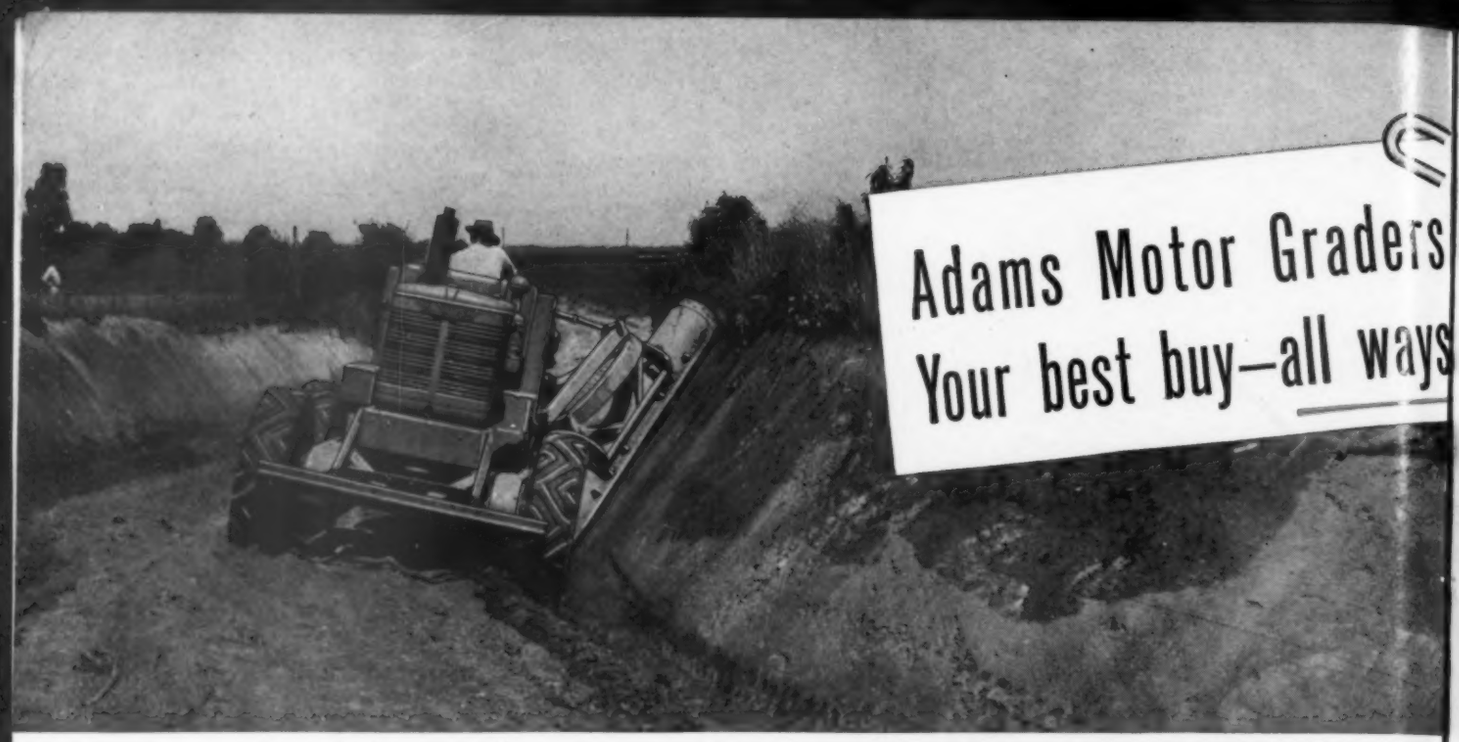
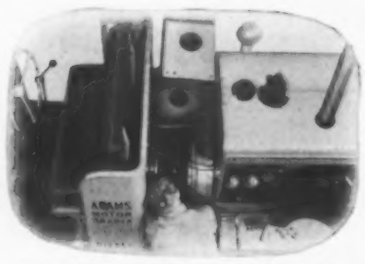
CHNOLOGY DEPARTMENT

ROADS AND STREETS

AUGUST 1947





1. Clutch easy to reach and service

2. Transmission readily accessible

3. Engine easily removed

Faster to service—Easier to maintain

● Thoughtful engineering pays off in many ways to make Adams Motor Graders *your best buy—all ways.*

For example, Adams Motor Graders are engineered for fast, efficient, economical servicing—through and through. Note in the accompanying pictures how even the usually hard-to-reach assemblies are readily accessible in Adams Motor Graders:

1. Clutch is conveniently located between cab and engine—with plenty of room for servicing without disturbing the engine. Entire clutch assembly can be completely overhauled, *by one man,* in about 4 hours.
2. Transmission and lower half of engine are reached merely by disconnecting and backing out the final drive assembly. This is an unusually fast and easy operation.
3. Engine is mounted so it can be quickly removed from frame, when so desired. This feature frequently saves many in-the-shop hours.

Yes, Adams Motor Graders are designed and built to spend fewer hours in the shop—*more hours on the job . . .* to do more work—*better, faster, cheaper.* Ask your local Adams dealer for complete information.

J. D. ADAMS MANUFACTURING CO. • INDIANAPOLIS, INDIANA

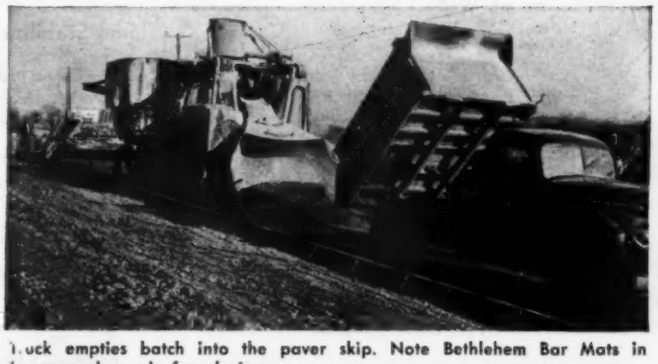
Adams

MOTOR GRADERS • LEANING WHEEL GRADERS • ELEVATING GRADERS

Workmen place Bethlehem Bar Mat in top of concrete slab. Nearly 93,000 sq yd of mats were used in this new road.

New 6½ mile Stretch in Highway to Thousand Islands

Joseph Sullivan (left), Engineer, N. Y. State Dept. of Highways, checks a detail of the job with Charles Cunningham, Superintendent (center), and Jack Canino, Office Superintendent, of Bero Engineering and Construction Co.



Truck empties batch into the paver skip. Note Bethlehem Bar Mats in foreground, ready for placing.

Long popular with motorists approaching the Thousand Islands from the west, New York's Route 3 originates at Hannibal, travels eastward some fifteen miles, then swings abruptly north to skirt the eastern fringe of Lake Ontario.

These photographs show recent construction of a new 6½ mile, 2-lane stretch of Route 3 from Fulton to Palermo. Bero Engineering and Construction Co., Buffalo, is the general contractor. Bar mats and reinforcing for two concrete bridges, furnished by Bethlehem.

Sticky stuff! With bar mats covered, workers spade excess concrete ahead of screed. Second screed in background.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

STEEL FOR HIGHWAYS

Road Joints • Reinforcing Bars • Bar Mats • Guard Rail
Tie-Rods • Guard Rail Posts and Brackets • Spikes
Wire Rope and Strand • Hollow Drill Steel
Fabricated Structural Steel • Bolts and Nuts
Sheet and H-Piling • Timber Bridge Hardware

BETHLEHEM STEEL

With aggregate and bulk cement hoppers close at hand, trucks have but short haul to skip. Strip in foreground is ready for hand finishing.

ROADS AND STREETS

AUGUST, 1947 • VOL. 90 • No. 8

With Roads and Streets Have Been Combined Good Roads Magazine And Engineering & Contracting

Articles Ahead

The Maine Turnpike
Planning and design of this controversial 48-mile toll project, plus photos and notes on aggregate production and hot-mix paving

Are Toll Roads Ever Justified?
Penetrating analyses by Commissioner Thos. H. MacDonald and Joseph Barnett of PRA.

"Contractors at Work" Series
How D. W. Winkleman worked a 200,000 cu. yd. borrow pit on up-[illegible] era-told project reports from the Editor's 20,000 miles of summer [illegible]

Servicing 70 Big Rigs
How a large western contractor performed greasing, refueling, servicing and field repairs on high-speed special hauling fleet for 6,000,000 cu. yd. airfield project

"Egg" Shaped Roller Speeds Bituminous Gutter Construction

Snow Removal and Ice Control
Reports from state, county and city organizations—several articles beginning in September

What Western Highway Engineers Are Thinking About
Reports of recent conference of the Western Assn. of State Highway Officials at Missoula, Mont.

Jobs and Equipment Kinks

Soils & Foundations
Another case article on soils studies and foundation design for large expressway project.

Other coming articles on: bridge erection, grading methods, estimating, pavement design, aggregate production, concrete hauling in non-agitating trucks

In This Issue

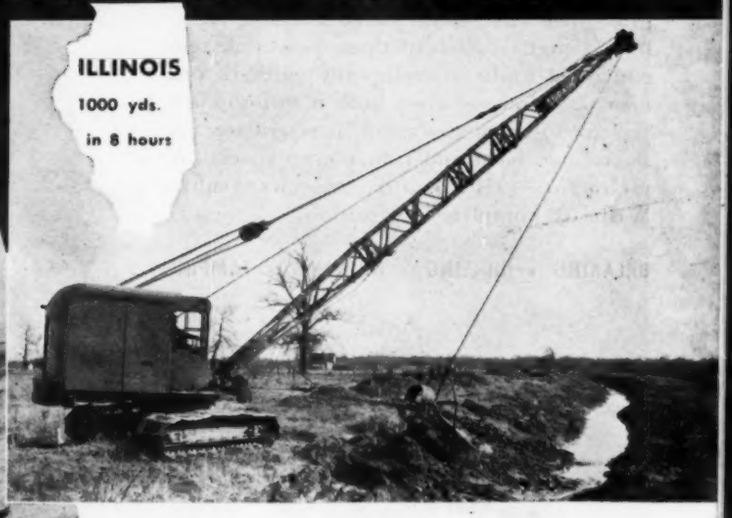
A magazine devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations, and to the construction and maintenance of airports.

Gillette Publishing Company
Publication and Editorial Offices,
22 West Maple Street, Chicago 10, Ill.

Acceptance under the Act of June 5, 1934, authorized Jan. 25, 1938, at Chicago, Ill. Published monthly. Subscription price $5.00 per year.

GOT A YEN FOR *Yardage?*

If you want a big producer in the ¾ yd. class, the Lorain 41 is your baby



THERE you are! Actual yardage records made in all types of digging, under different conditions and from widely separated sections of the continent. It's the kind of proof that makes sense to profit-minded contractors. If yardage is your yardstick of value, call or write your local Thew-Lorain distributor now. He can show you Lorain-41's right in your own area with equally impressive performance records.

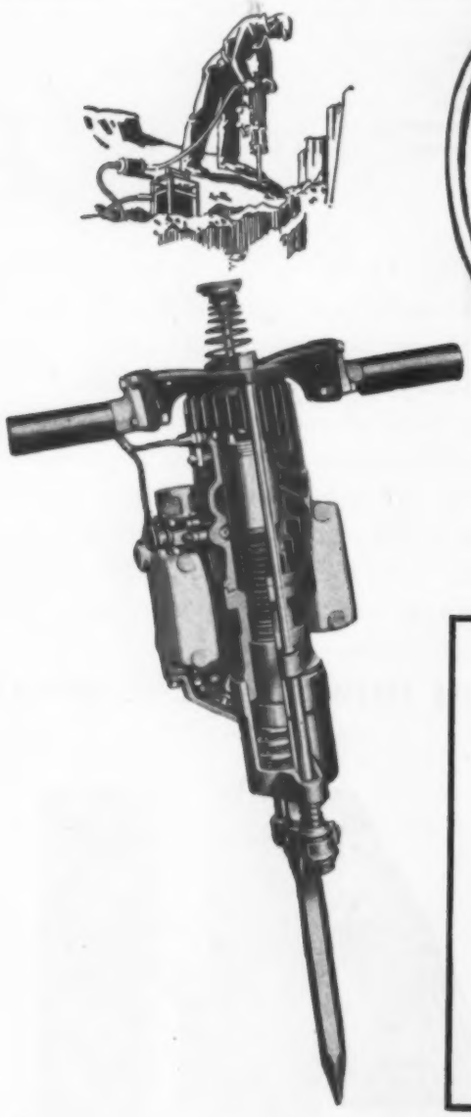
THE THEW SHOVEL COMPANY
Lorain, Ohio

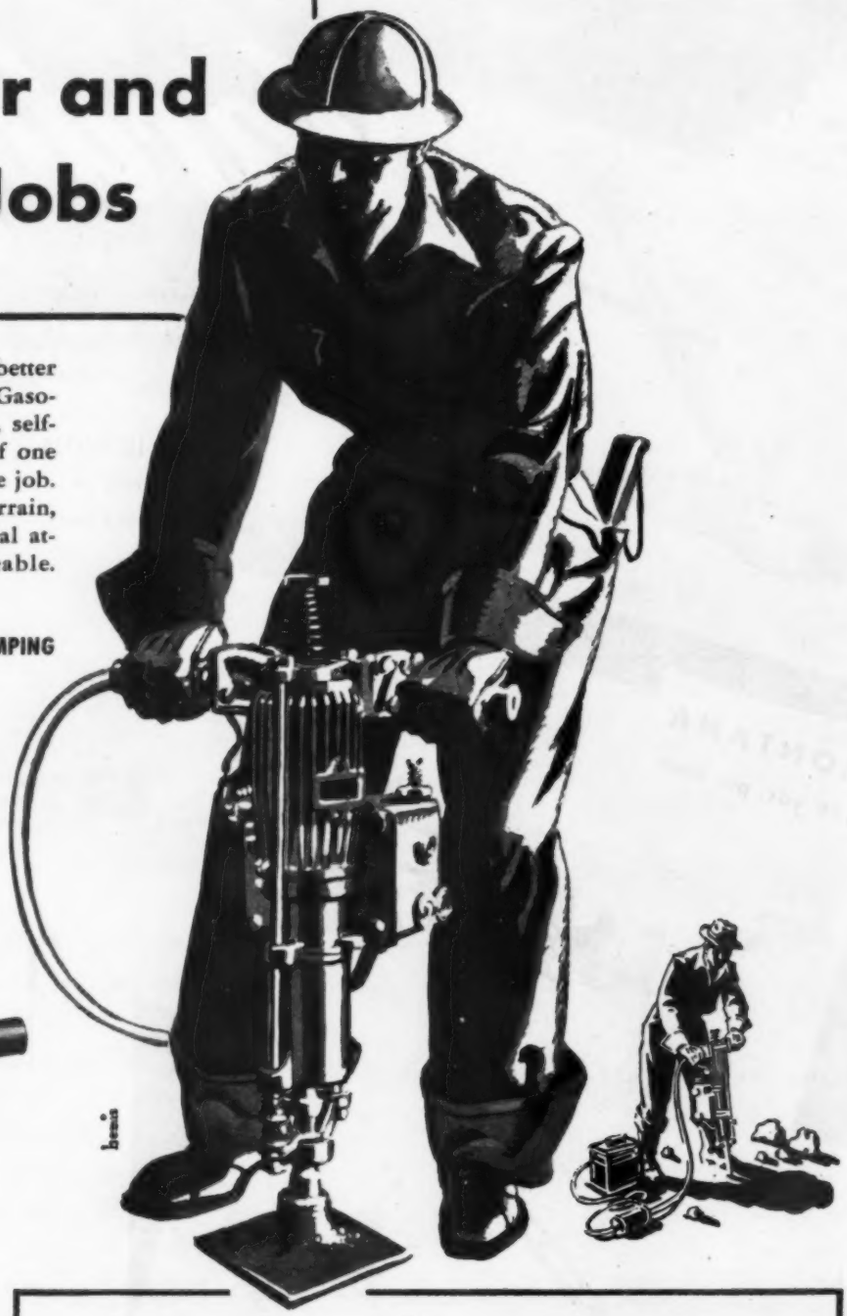
Thew® **Lorain 41**

For Better and Faster Jobs

Speed up your work schedules—do a better job at less cost—with Barco Portable Gasoline Hammers. Each of these powerful, self-contained tools multiplies the work of one man, saves money every hour it's on the job. In hard-to-reach spots and in rough terrain, Barco hits hard and fast. Eleven special attachments—all instantly interchangeable. Write for complete information.

BREAKING • DRILLING • DRIVING • TAMPING





BARCO

PORTABLE GASOLINE HAMMERS

FREE ENTERPRISE—THE CORNERSTONE OF AMERICAN PROSPERITY

BARCO MANUFACTURING COMPANY, NOT INC.
1815 WINNEMAC AVENUE, CHICAGO 40, ILLINOIS
In Canada: The Holden Co. Ltd., Montreal, Canada

Here's a new and better way to "MAKE BOTH ENDS MEET"

Now—a NEW Koppers service has been combined with an established Koppers product, to help you conserve engineering TIME in your highway department, and bridge DOLLARS in your highway budget.

By applying the modern principle of using *standardized* parts to build *"Made-to-Measure"* timber trestle bridges, Koppers helps you to eliminate much of the costly, time-consuming design, detailing, and bill-of-material preparation that are ordinarily required in bridge projects.

By pre-fabricating all members, Koppers helps you to *speed-up construction;* only assembly is required at the job site. Erection can be handled with no special equipment, using regular highway crews plus local labor.

This new Koppers service makes it easier than ever before to utilize pressure-treated timber-trestle bridges—with their *proven economies* of low first-cost, low maintenance cost, adaptability to change, and LONG LIFE. Koppers pressure-treatment gives *dependable protection* against decay . . . weathering . . . and insect attack.

The new "Made-to-Measure" bridge book illustrated carries plans of abutments, decks, bents and railings that can be combined in a number of ways, to solve practically all problems ordinarily encountered. Data sheets, furnished with the book, provide an easy means of submitting necessary information to Koppers for a quotation. Write for a complimentary copy of this important new publication.

K
KOPPERS

PRESSURE-TREATED WOOD

KOPPERS COMPANY, INC.
PITTSBURGH 19, PENNSYLVANIA

How PARSONS TRENCHLINER* ELIMINATES COSTLY HANDWORK

*T/M REG. U. S. PAT. OFF.

1 Trench Next to Walls Without Hand Work

Parsons Trenchliner digs at top efficiency within just a few inches of walls, fences, telephone poles. Boom shifts across entire width of Trenchliner — easily and smoothly, because it rides on large diameter rollers. Shifting boom permits Trenchliner to sidestep obstructions that stop other trenchers, saves money on sections of trench that formerly were 100% costly hand work.

2 Pipe Across Trench Is No Problem

Trenchliner digs up to pipe, then over, then slides boom under pipe. Hand work is virtually eliminated.

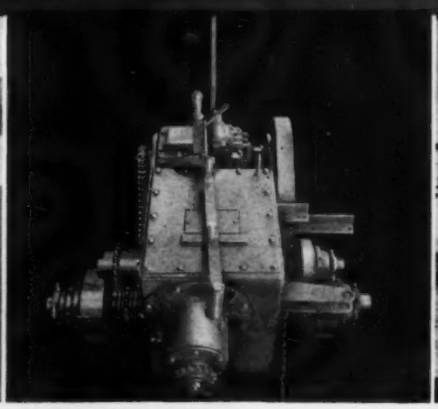
3 Clean Bottom, Straight Walls

Trenchliner ditches are uniform, the width you need at the depth you want, straight-walled, round-bottomed, ready for pipe with minimum hand work.

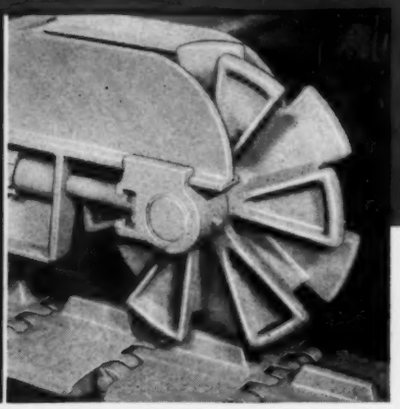
PARSONS COMPANY
Newton, Iowa • Koehring Subsidiary

Eliminates costly maintenance hand work

SELF-CLEANING BUCKETS—No hand work. Buckets are scraped out automatically by spring-cushioned cleaner. Each bucket gets a big bite . . . all pay dirt . . . because bucket is always clean.



OIL CHANGED ONLY TWICE A YEAR — Even under continuous operation. All gears activating operations of Parsons Trenchliners enclosed in one oil-tight case, in continuous oil bath.



PROTECTED AGAINST ABRASIVE WEAR — Entire crawler assembly is self-cleaning. Main machinery is well shielded from bucket line spill . . . stays clean . . . moving parts throughout are protected.

Full Batch Discharged in 7 Seconds

Kwik-Mix Dandie Concrete Mixers

Tilted Flow-Line Discharge Chute, exclusive on the Kwik-Mix Dandie line of concrete mixers, reaches deeper into the drum, intercepts tumbling concrete at just the right angle to maintain natural flow-line in discharge. Kwik-Mix Dandie mixers are available in the following sizes: 3½-S, 6-S, 11-S, 16-S.

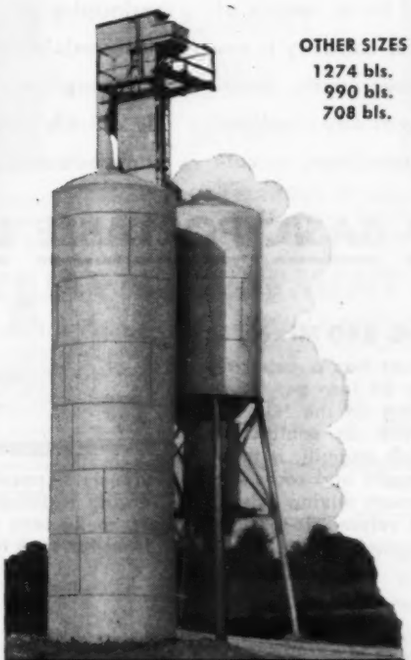
KWIK-MIX COMPANY
PORT WASHINGTON 7 WISCONSIN

Top Capacity plus Full Portability

Johnson Twin-Silo Bulk Cement Plant

Johnson Twin Silo bulk cement plant, stores as much as 1550 barrels of cement, yet is fully portable. Welded construction speeds erection.

OTHER SIZES
1274 bls.
990 bls.
708 bls.



C. S. JOHNSON COMPANY
CHAMPAIGN, ILLINOIS

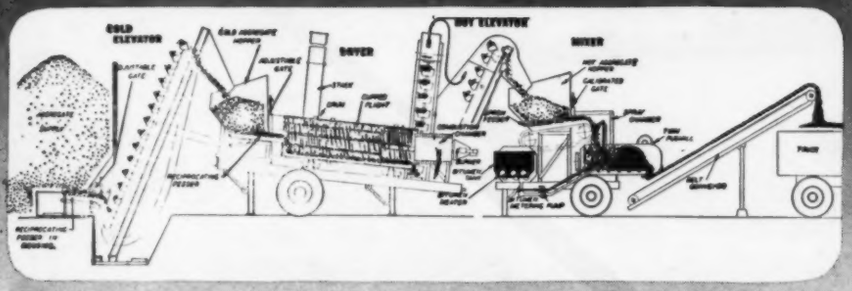
Enclosed Gears Run in Continuous Oil Bath

Koehring 304 Heavy-Duty Pullshovel

Heavy-Duty leader in the ¾ yard class. An excellent tool for the trenching jobs where wide sloped trenches are required or where nature of material to be excavated calls for shovel digging. Maintenance time cut in half, because all gears are enclosed, run in continuous oil bath. Anti-friction bearings require lubrication only twice a year.

KOEHRING COMPANY
MILWAUKEE 10 WISCONSIN

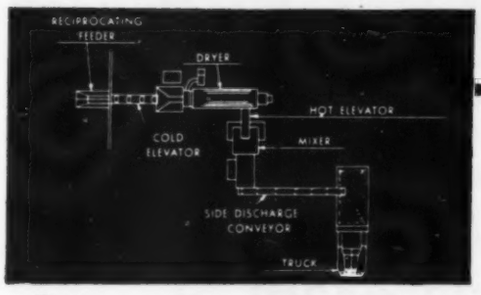
BITUMINOUS MIX



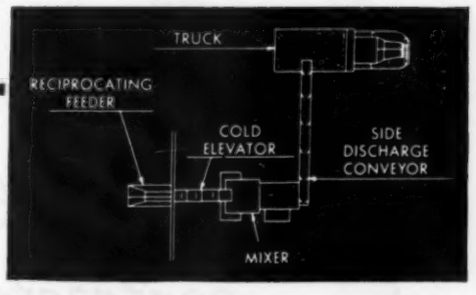
for REPAIR MAINTENANCE *and all* SMALL JOBS!

A CONSTANT FLOW UP TO 25 TONS PER HOUR

This chart shows the flow of materials through the B-G Maintenance Plant. The aggregate is fed to the Cold Elevator by a Reciprocating Feeder through adjustable gates—then to the Dryer Hopper. The material is fed evenly to the Dryer drum where it is lifted and dropped continuously through the hot gases which flow the length of the Dryer. As the moisture is removed, the mineral aggregate is heated to keep the mix workable until placed. The Hot Elevator, which elevates dried aggregate to the Mixer Hopper, is an integral part of the Dryer. In the Mixer, an apron feeder continuously and accurately measures the dried aggregate through the calibrated gate. Since the bitumen pump is of the positive displacement type, and is interlocked with the aggregate feed, the percentage of bitumen to aggregate is held constant.



FLEXIBILITY OF SETUP



WITH DRYER, *here the Reciprocating Feeder feeds one or two types of aggregate to the Cold Elevator which charges the Dryer Hopper.*

WITHOUT DRYER, *in this setup the Dual Gate Reciprocating Feeder feeds the Cold Elevator, which directly charges the Mixer Hopper.*

AUXILIARY EQUIPMENT

- **2-COMPARTMENT BIN** *for Model 812 Feeder. Has capacity for 13 tons aggregate supply, with provision for installation of Reciprocating Feeder below.*
- **DUST COLLECTOR.** *To avoid the escape of fines from the exhaust gases during the drying process.*
- **ASPHALT TRANSFER PUMP.** *Provides a means of transferring bitumen from cars, or transfer units to storage or Mixer tank.*
- **FINES FEEDER** *mounted over Mixer when additional filler is required.*

SEND FOR NEW BULLETIN

For more complete information, fill in and send this convenient coupon. It will bring you your copy of the bulletin, "A Small Plant That Does a Big Job!"

Greene

BARBER-GREENE COMPANY
633 West Park Avenue
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Send me bulletin, "A Small Plant That Does a Big Job!"

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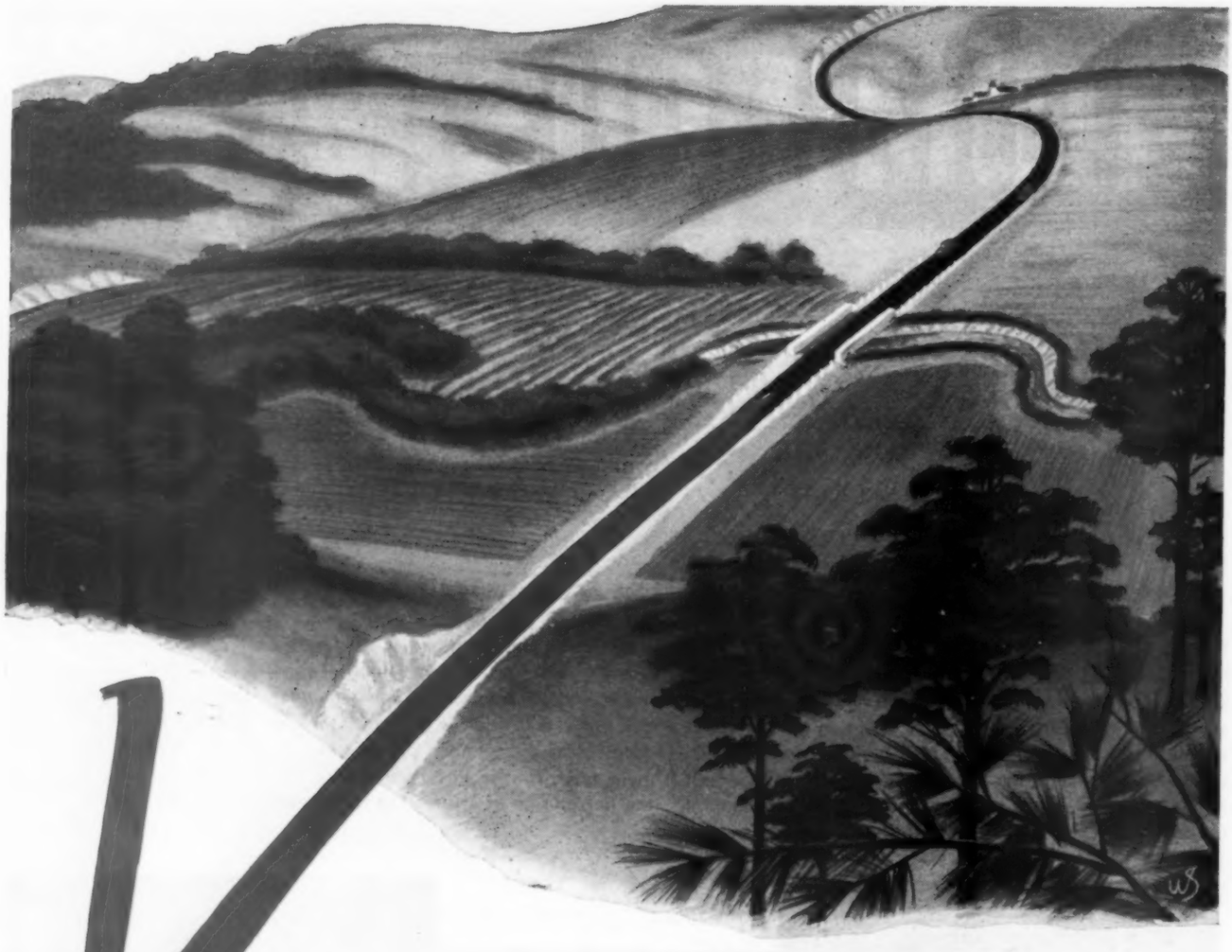


Check...endorsed by Midwest contractors for over 20 years

PERIODIC checks of roads built with Ohio Oil Asphalts show why these asphalts receive the endorsement of Midwest contractors and public officials. During more than 20 years, Ohio Oil Asphalts have maintained consistent records for long life, long-range economy and minimum repairs.

The Ohio Oil Company manufactures a complete line of all grades of rapid, medium and slow-curing asphalts and asphalt cements.

60 YEARS OF PROGRESS 1887-1947 THE OHIO OIL COMPANY

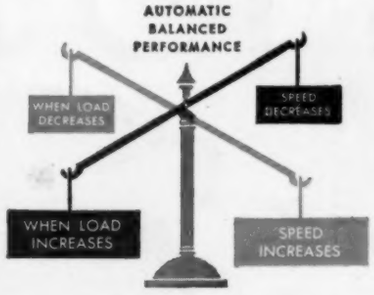
MARATHON

OHIO OIL COMPANY ASPHALTS • The Ohio Oil Company • Asphalt Department

ROBINSON, ILLINOIS • LOVELL, WYOMING

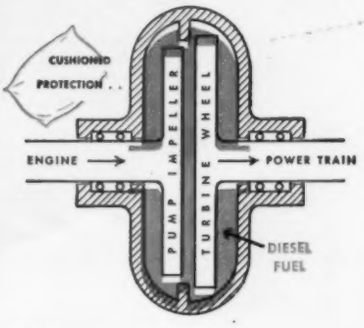
Producers of Petroleum since 1887

The Hydraulic Torque-Converter Tractor . . .
Takes Work Away From Operator
YET GETS MORE WORK DONE!



PRODUCES MORE

The hydraulic torque converter tractor gets more done because it works at higher *average* speeds—achieved in numerous ways. Torque converter automatically and constantly keeps tractor at a travel speed which utilizes full engine horsepower, regardless of load . . . also provides fast acceleration — peak hauling speed reached quickly. Keeps tractor moving by eliminating most of the gear-shifting. Increases operator efficiency because there's less effort required to operate tractor.



CUTS UPKEEP COST

Longer life, less breakage and wear are assured for tractor and auxiliary equipment because operation is continuously smooth. There is no shock from master clutch engagement, because in the torque converter tractor it engages under no load. The diesel fuel, which operates the converter, acts as a cushion between engine and tractor train — no sudden twists or jerks can be transferred between driving and driven parts.

MAKES IT EASIER FOR OPERATOR

No restarting — engine can't be stalled. No constant shifting — torque converter automatically selects the maximum speed in each of the wide speed ranges at which load can be moved. No jolts and shock to tire operator — power flow is smooth and even.

To approach the accomplishment of a torque converter . . . a fluid coupling would be required, plus a transmission with an unlimited number of gear ratios, and an operator with the impossible task of continuously shifting into the right gear at just the right moment — instantaneously.

WHAT THE TORQUE CONVERTER IS

The Twin Disc torque converter in Allis-Chalmers tractors is a remarkably simple mechanism. It consists of only two wheels — impeller and turbine — rotating independently of each other in an oil-filled housing. The impeller is directly connected to the engine, and the turbine to the power train.

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

★ *Originator of the Torque-Converter Tractor*

NOW A GREAT

Featuring

Positive power steer

Electrically operated gear on yoke king-pin steers Tournapull and Scraper as one integral unit . . . keeps rig rolling in desired direction at all times . . . enables the operator to turn 90° right or left at the touch of a button. This means faster handling with increased safety and maneuverability. Short turning radius saves jockeying back and forth on narrow grades.

Finger-tip electric control

On the modern Tournapull all operations are electrically controlled by individual motors — with centralized finger-tip control from dashboard. Makes entire operation faster . . . easier on operator . . . easier on machine . . . easier to control accurately. These motors — new AC type with lugging characteristics of DC motors — are specially designed for earthmoving service.

LE TOURNEAU LET EQUIPMENT

See your Le Tourneau Distributor NOW for complete information

NEW "C" TOURNAPULL

11 YARDS
STRUCK CAPACITY

Increased flotation and traction

The new "C" Tournapull gives you extra flotation because big tapered bead tires permit lower pressures . . . more ground contact. You also get improved, sure-footed traction because revolutionary new type differential makes one drive wheel pull 4 times harder than the other before it will slip . . . automatically supplies most power to the wheel on firmest footing.

Instantaneous speed selection

New constant mesh transmission gives you instantaneous selection of gear ratios anytime — without loss of momentum or shifting gears. Just move selector lever to speed wanted and air-actuated clutches give it to you right now. This way, you get into high speed faster, travel faster on grades, pull easier through soft fills, because gear shifting is eliminated.

Tournapull—Trademark Reg. U.S. Pat. Off. C69

LETOURNEAU
PEORIA, ILLINOIS

HIGH-SPEED RUBBER-TIRED

TOURNAPULLS

UNIT'S "Big 3"

Designed for FASTER and EASIER OPERATION . . . where the Going is TOUGH!

UNIT 514
½-Yard Dragline

UNIT 1020
¾-Yard Shovel

ALL *Unit Models* are Convertible to ALL *Attachments*

UNIT 357
5-Ton Mobile Crane with Magnet Attachment.

Here are three time-tested UNIT machines that continue to "make the headlines" because of their unusual speed, efficiency and all-around dependability. Check the following exclusive UNIT features: *Compact, streamlined design . . . Straight line engine mounting . . . Drop forged alloy steel gears . . . Automatic traction brakes . . . Interchangeable disc type clutches . . . One-piece cast gear case* . . . and above all, UNIT's safety-promoting *FULL VISION CAB.* No other excavator on the market has all these features.

CONTACT FACTORY DIRECT *for Price and Delivery*

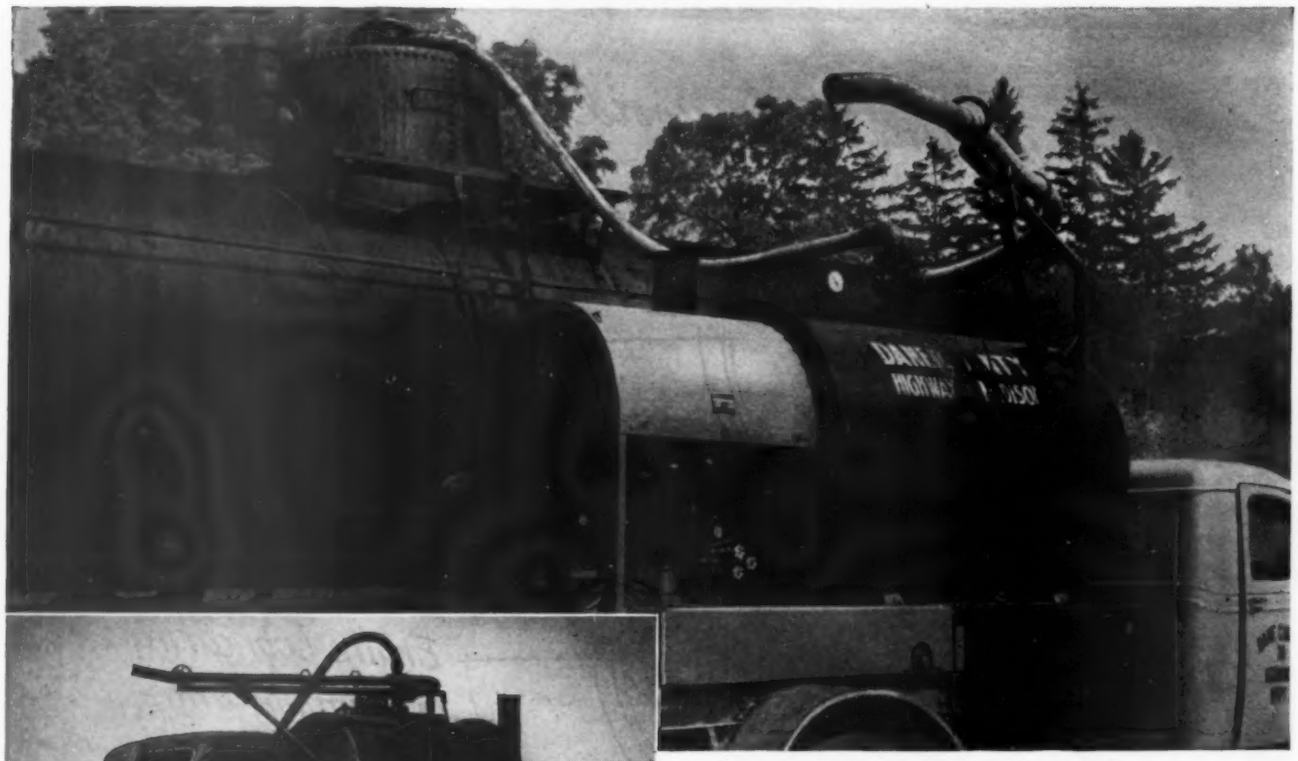
UNIT CRANE & SHOVEL CORP.

UNIT CRANE & SHOVEL CORP. UNIT MILWAUKEE WISCONSIN

6407 W. BURNHAM ST.
MILWAUKEE 14,
WISCONSIN, U.S.A.

A 4894-1PC-R

All hooked up and ready to deliver hot oil . . . fast!



Truck-mounted Booster. Heats by direct firing. Loads direct to distributor or returns to tank car. 2 sizes for truck or trailer mounting.

Check These Advantages

- Heats material 3 times as fast as steam.
- Heats to higher temperatures.
- No steam or water necessary.
- Heats only amount of material required.
- Circulates material while heating—no separation or damage —assures uniform application.

You Get All the Hot Material You Need Right When You Need It — With Cleaver-Brooks Portable Boosters

CLEAVER-BROOKS Portable Pumping Boosters get pumpable bituminous materials out of tank cars and raise it to desired temperatures in almost unbelievable speed.

With Cleaver-Brooks Boosters, the heating speed does not depend on the size and conditions of tank car coils. It heats direct and 3 times as fast as any other method. What's more, you need only heat the amount of material you need — no heating of the entire car.

Cleaver-Brooks Boosters are reliable, long service, low maintenance units. Most of the original models, built 15 years ago are still giving dependable every day service. There are more Cleaver-Brooks units in service than any other make. For full details write for bulletin RM 102

Write on Your Business Letterhead . . . For the Bituminous-Mix Calculator — a ready reference slide rule showing weight of mix needed in lbs. and tons based on area and depth of area to be covered.

CLEAVER-BROOKS COMPANY
5106 NORTH 33rd STREET • MILWAUKEE 9, WISCONSIN

Cleaver-Brooks

PIONEERS AND ORIGINATORS OF

TANK CAR HEATERS . . . BITUMINOUS BOOSTERS . . . AUTOMATIC STEAM PLANTS

HOW NEW KB INTERNATIONALS ARE *Masterfully Specialized to their Jobs*

New KB Model Internationals are the finest values in International Truck history. And International values are so outstanding that for 16 years more heavy-duty Internationals have served American commerce and industry than any other make.

But rugged quality is only one reason for International leadership. Another is International's masterful ability to *specialize* trucks to their jobs.

There are 15 basic KB Internationals. Gross weight ratings range from 4,400 to 35,100 pounds. Ten different engines are used. Axles, transmissions and tandems are available for every requirement.

International *specializes* its 15 basic KB Models into more than 1,000 different type trucks—a result of 40 years experience, engineering skill and matchless facilities. *That's fitting the truck to the job!*

Now add this: International can accurately tell every operator just what his maximum loads should be in terms of the exact conditions under which his trucks operate—an exclusive International service that enables the operator to get the most in operating economy, low maintenance costs, and long, trouble-free performance.

For details of new KB Internationals, *expertly specialized,* see your International Dealer or Branch.

Motor Truck Division
INTERNATIONAL HARVESTER COMPANY
180 North Michigan Avenue Chicago 1, Illinois

40TH ANNIVERSARY OF INTERNATIONAL TRUCKS
1907-1947—Forty Years of International Truck Service to Industry, Commerce and Agriculture

INTERNATIONAL

INTERNATIONAL *Trucks*

a 3 Point Program
for Surer Road Building Profits

CECO offers you more than precision road building materials. It offers you a 3-point program for surer profits based on construction knowledge gained from years of practical experience. Call any one of 23 offices located coast to coast, for engineering skill and fine road building materials . . . plus a plan for road building profits. Remember Ceco's 3-point program takes the guesswork out of bidding, cuts down your detail work and one order brings you materials where you need them, when you need them.

CECO STEEL PRODUCTS CORPORATION
GENERAL OFFICES: 5701 West 26th Street, Chicago 50, Illinois

CECO STEEL

TYPICAL CECO HIGHWAY PRODUCTS • Welded Wire Fabric • Metal Center Strips
Cecure Curing Compound • Reinforcing Steel • Load Transfer Devices • Joint Sealing Compound
Dowel Bar Supports and Sockets • Stake Pins • Expansion Joints • Sub-Grade Paper

In construction products **CECO ENGINEERING** *makes the big difference*

drilling magic

...the flexibility and deep-hole drilling speed of Le Roi-Cleveland Wagon Drills produce unbelievably low-cost footage

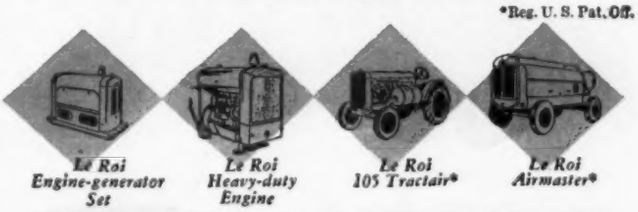
Here's a wagon drill that can practically turn itself inside out — it drills at any angle. This flexibility and the ease with which you can make set-up changes save you time and money—holes can be drilled in the most effective spots regardless of the contour of the ground. This, of course, means proper burden on the hole, better fragmentation, lower costs.

And power—say, when that 4-inch bore Le Roi-Cleveland Drifter starts hammering on a piece of drill steel, it keeps driving it down until you have a 40-foot hole. The advantages of this dependable machine's high drilling speed are made greater through the use of a quick-returning feed. Less time is lost in changing steel, so that much more footage is drilled per shift.

The throttle, feed, and blowing controls consist of a single, compact, conveniently located unit. This helpful feature gives the operator complete control over the machine at all times. He can easily select the right feed for the formation being drilled.

Ask your Le Roi distributor to give you all the facts. Send for our latest wagon-drill bulletin.

*Reg. U. S. Pat. Off.



Le Roi Engine-generator Set | *Le Roi Heavy-duty Engine* | *Le Roi 105 Tractair** | *Le Roi Airmaster**

LE ROI COMPANY

CLEVELAND DIVISION
Manufacturers of Cleveland Rock Drills
Cleveland 11, Ohio

LE ROI COMPANY, General Offices, Milwaukee 14, Wisconsin

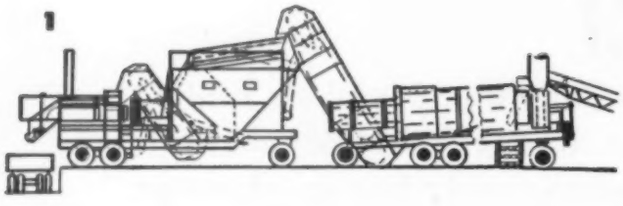
NEW YORK • WASHINGTON • CLEVELAND • MILWAUKEE
BIRMINGHAM • TULSA • BUTTE • SAN FRANCISCO

RD-8

Continuflo
Asphalt Plant

WITH ONLY
2 MAIN UNITS

1



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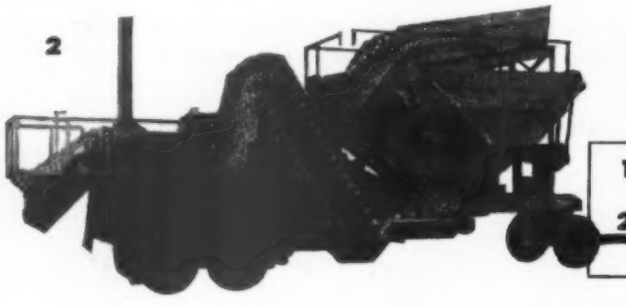


THE NEW *Continuflo* Central Mix Asphalt Plant brings you the most portable and compact continuous process asphalt plant ever built. It is recognized as one of the great developments in asphalt equipment.

Consisting of only 2 main units—the mixer and the drier—*Continuflo* is easier to move . . . easier to locate on the job.

In *Continuflo*, all mixing operations are fully automatic. The asphalt metering pump is interlocked with the aggregate feeder to provide correct proportioning of bitumen and aggregate. There is no variation in the finished product. The human element is out—the correct mix is assured!

Write for complete information about *Continuflo*—the year's outstanding development in asphalt equipment.

PIONEER ENGINEERING WORKS
1515 CENTRAL AVENUE • MINNEAPOLIS 13, MINNESOTA

1 *IN A STEADY, CONTINUOUS FLOW* aggregate passes from the feeder conveyor through the drier, hot elevator and gradation unit to the pugmill.

2 *A COMPACT PLANT*—Gradation and Mixing Unit combines on one truck the gradation screen, proportioning unit, transfer elevator and mixer.

BUY BOTH—
Higher Output, Lower Upkeep!

Pioneer
Continuflo **EQUIPMENT**

READ WHY A TRUCK LIKE THIS

CAN SAVE YOU MONEY!

This truck—like every Dodge "*Job-Rated*" truck—is built to fit a specific hauling job.

It's powered with exactly the right one of 7 engines—plus the right gear ratio—to provide the pulling power the job requires, with maximum economy.

It's built with exactly the right clutch, transmission, rear axle—the right units throughout . . . for "top" performance, longer life, and maximum economy . . . on the job for which it was built.

It stands to reason that a truck "*Job-Rated*" to haul *your* loads over *your* roads —will save YOU money!

You can get a truck to fit *your* job—a truck to give better performance, better service to your customers, and to save you money!

Simply explain your hauling problems in detail to your Dodge dealer. He has the engineering data from which to recommend the best truck investment you can make.

★ ★ ★

Your Dodge dealer is interested in your continued satisfaction: *First*, by selling you a truck that fits your job; *Second*, by giving you dependable Dodge truck service; *Third*, by providing you with truck parts that are identical with original Dodge "*Job-Rated*" truck parts.

ONLY DODGE BUILDS "*Job-Rated*" TRUCKS

DODGE

Fit the Job . . . Last Longer !

View on South Carolina's divided, four-lane concrete highway about midway between Greenville and Spartanburg. Road carries about 4,500 vehicles each day.

South's Longest Divided, Four-Lane Highway is *CONCRETE*

THE concrete-paved, four-lane, divided highway, which runs 27½ miles between Greenville and Spartanburg in South Carolina, is the South's longest divided-lane road. It provides a safe, fast and convenient route for the heavy bus, truck and passenger car traffic between these two industrial cities.

The project, completed in 1945, utilizes for one traffic lane, nearly ten miles of concrete pavement built 17 to 21 years ago.

Whether for rural highways, urban expressways or residential streets, concrete pavement gives long years of service at *low annual cost*—the true measure of pavement economy.

The long life of concrete has been demonstrated all over the country. Of more than 100,000 miles of concrete pavement built on state rural primary highway systems since 1910, approximately 80 per cent of it was still in service at the beginning of 1946.

Send for free copy of new book, "Concrete Pavement Design," for roads and streets carrying all classes of traffic. Distributed only in United States and Canada.

PORTLAND CEMENT ASSOCIATION

Dept. A8-28, 33 W. Grand Ave., Chicago 10, Illinois

A national organization to improve and extend the uses of concrete . . . through scientific research and engineering field work

Here's the "Reason-Why"

WATER DISTRIBUTOR plus SEAMAN MIXER plus ROLLER

MEANS HIGHER DENSITIES IN EARTH COMPACTION WORK

Compaction simply means that the minute soil particles have been moved by pressure, so closely together that they are bound in a dense mass. . . . But soil must first be pulverized (reduced as closely as possible to soil particle size) before it can be given maximum compaction, — for the water addition, which acts as a lubricant to permit the soil particles to move closely together, must form a film around each particle to perform this function most efficiently. . . . There's the vital reason why the SEAMAN MIXER, in conditioning soil for compaction, makes possible densities of 100%. The fine soil pulverization readily produced by the SEAMAN brings the moisture content to optimum more quickly and more positively, — and thus gives maximum efficiency to the water as a soil particle lubricant. . . . Even in compaction operations where no water was used, the SEAMAN, used to pulverize each lift prior to rolling, has repeatedly and consistently developed densities of 95%. . . . So, for all earth compaction work, whether for dams, levees, or fills, — get maximum density more quickly, — and more cheaply with the SEAMAN . . . It's as vital to soil compaction as the rolling equipment.

HAVE YOU YOUR 1947 COPY?

The ever-popular book "Soil Stabilization Methods", compiled by Seaman engineers is yours on request. Just ask for Bulletin RS-25.

The **SEAMAN MIXER**

SEAMAN MOTORS, INC.
MILWAUKEE 3, WISCONSIN

FWD Trucks Provide Fast, Safe, Sure Transport of Heavy Machinery or Material...On or Off the Road

rfauling power shovels and other heavy machinery, huge loads of cement, bulky loads weighing 50 tons or more — those heavy-duty hauling jobs are usually entrusted to FWD four-wheel-drive trucks.

The safety and surety — the reliable pulling power of four or six driving wheels — the ability to move the load to location on or off the highway — these FWD advantages count heavily in this and other heavy-duty trucking operations.

Wherever motor truck performance must be more than usually dependable—in heavy hauling, in highway or municipal service, in utility line construction and maintenance, in oil-field operations — FWD four-wheel and six-wheel-drive trucks are rendering important service.

THE FOUR WHEEL DRIVE AUTO COMPANY
CLINTONVILLE, WISCONSIN
Canadian Factory: KITCHENER, ONTARIO

This $500,000 picture needs $4,745 more . . . Do you see WHAT'S MISSING?

These floating derricks valued at $500,000 can't operate without the wire rope which is missing in the picture. It costs about $4,745 to equip the derricks with Preformed Wire Rope made of Improved Plow Steel. That's only $790 more than ordinary wire rope—and Preformed is far more economical.

When you buy any machine rigged with wire rope, make sure it comes equipped with Preformed. More and more manufacturers are standardizing on Preformed for their original equipment because it improves performance of their products. It's a money-saver because it lasts longer. It's easier and safer to handle.

Write for Free Copy of helpful book about Preformed. Address the Preformed Wire Rope Information Bureau, 520 N. Michigan Avenue, Chicago 11, Illinois.

Ask your own wire rope manufacturer or distributor

PREFORMED WIRE ROPE

LASTS LONGER
HANDLES EASIER

LOWER YOUR LOADING COSTS

A truly modern loader that incorporates the latest and best ideas in design, function and control. Conveyorized discharge chute permits lower overhead clearance (11'9"), and speedier handling of material.

IT DOES THIS

Gets from job to job at *truck* speed.

Handles any loose material quickly and economically.

WITH THESE

One man operation.

Hydraulic control.

Capacity—3 to 5 cu. yds. per minute.

Positive chain crowd.

Mounts on any standard 1½ or 2 ton truck chassis.

Self feeding augers feed material constantly, efficiently, into 20" buckets.

•

Write for further information and name of your distributor.

EAGLE

JAW CRUSHERS • IMPACT BREAKERS
PULVERIZERS • CONVEYORS • LOADERS

CRUSHER CO., *Inc.* GALION OHIO·U·S·A

Truer Words Were Never Spoken- Mr. Winkelman

EXCERPT FROM A PAPER GIVEN BEFORE THE ASSOCIATION OF HIGHWAY OFFICIALS OF THE NORTH ATLANTIC STATES, ATLANTIC CITY, FEB. 27, 1947

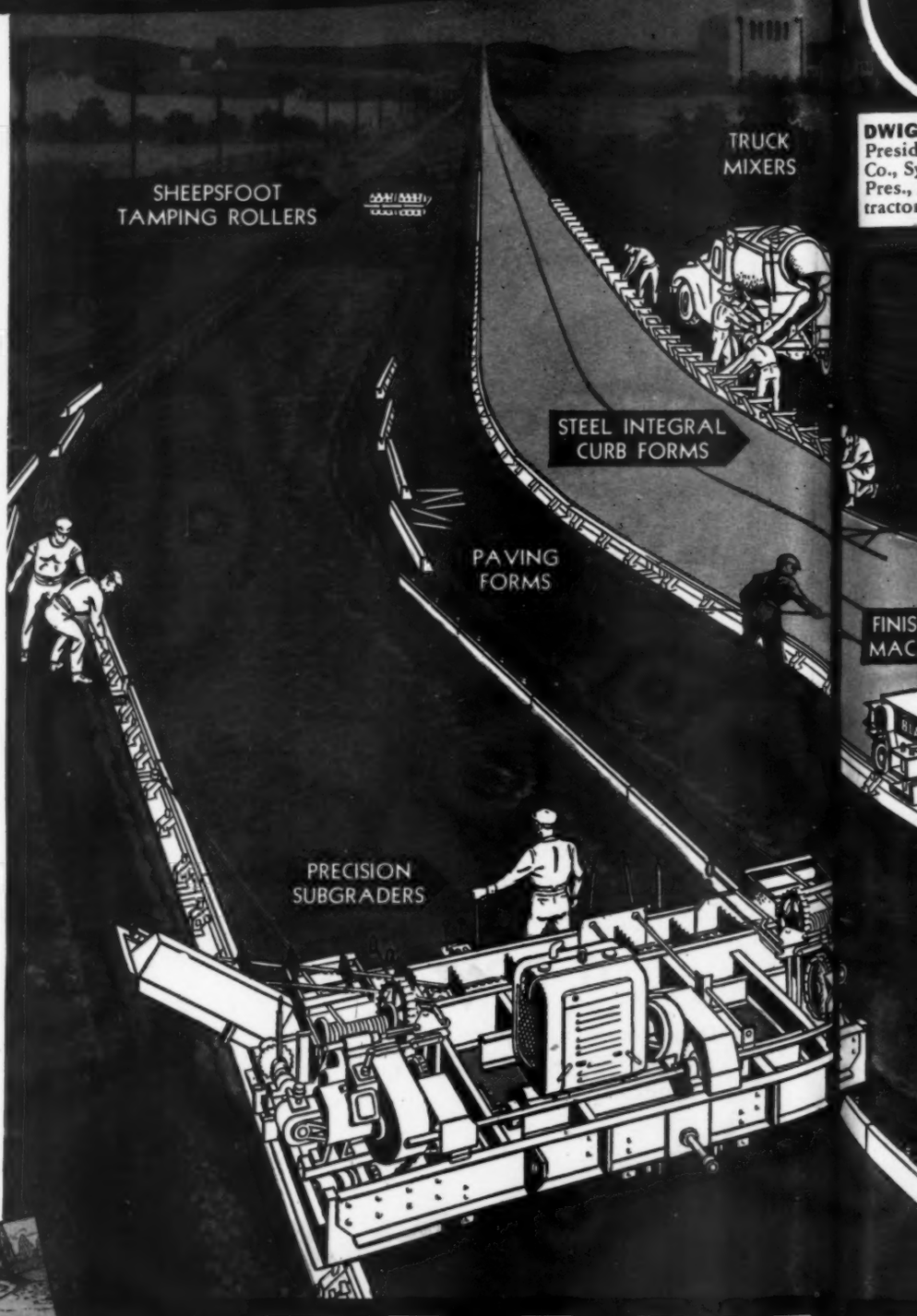
The Best Concrete Paving
. . . with the Fewest Men
. . . at Lowest Cost
. . . in the Quickest Time

can be done if the job is thoroughly mechanized by Blaw-Knox . . . the contractor's only single source for a complete outfit of job-tested —*tried and true*—concrete paving machinery.

Now, when bids are submitted with your fingers crossed —the efficiency that Blaw-Knox builds into its machines *really pays off* for the contractor.

BLAW-KNOX DIVISION
of Blaw-Knox Company
2003 Farmers Bank Building,
Pittsburgh 22, Pa.

See your Nearest Blaw-Knox Distributor.



BLAW-K

Time and Labor Saving CO


"One of the methods by which contractors can cut highway construction costs is through the use of machinery which increases the productivity of workmen."
DWIGHT W. WINKELMAN
President, D. W. Winkelman Co., Syracuse, N. Y., and Vice Pres., Associated General Contractors of America, Inc.
CLAMSHELL BUCKETS
PORTABLE AGGREGATE BATCHING PLANTS
PORTABLE BULK CEMENT PLANTS
Concrete Paving must be mechanized
FINISHING MACHINES
PAVING SPREADER-VIBRATORS
CONCRETE BUCKETS
STEEL FORMS FOR CONCRETE CONSTRUCTION
KNOX
ng CONSTRUCTION EQUIPMENT

THROUGH THICK...

...AND THIN!

(Fitzsimons Viscometer)

Horatio Alger heroes never struggled harder than do research laboratory technicians today. The intent scientist above is a Sinclair Research technician . . . a skilled specialist at determining how thick or how thin Sinclair lubricating oils must be for specific applications.

With the important Fitzsimons Viscometer, a research measuring apparatus of fine precision, Sinclair Laboratory experts are able to determine with extreme accuracy viscosity characteristics in their studies of lubricants needed to protect your valuable machinery. Precise, accurate flow measurement provides information important in the development of improved products for correct lubrication with light-bodied oils for today's precision-built engines and machinery.

This viscometer is one of several different types with which Sinclair Research goes through thick and thin to assure you of industrial lubricants of proper viscosity. It is typical of the equipment and facilities which are constantly at your service in developing Sinclair lubricants of uniformly high quality to suit your specific application.

Sinclair Automotive Oils

For Bus, Truck and Tractor

OPALINE

TRUCK BUS TRACTOR

OIL

Superior lubrication in the long pull, under heavy loads

• • •

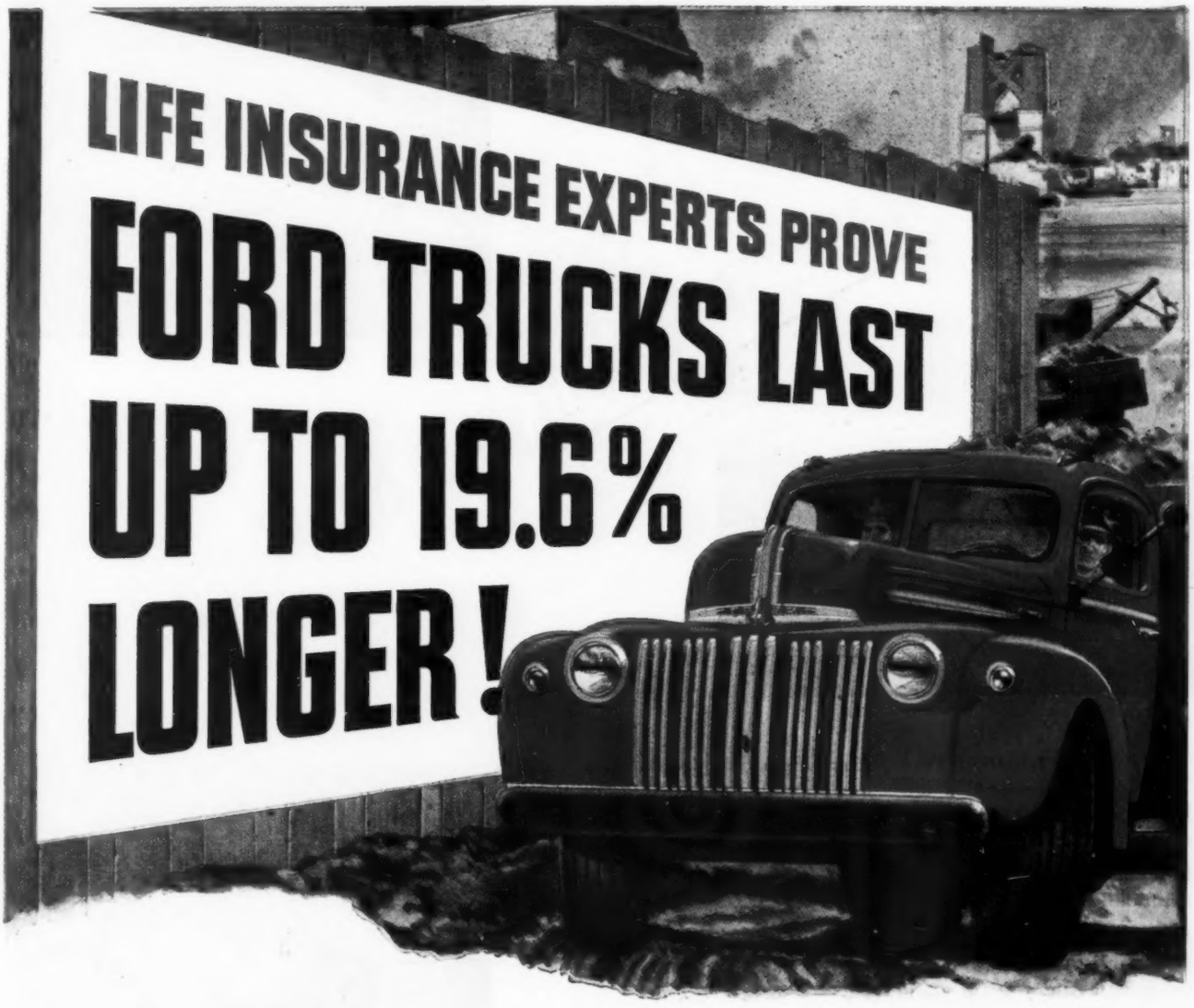
Keeps engines clean . . .
Sustains top engine performance

SINCLAIR REFINING COMPANY • 630 FIFTH AVENUE, NEW YORK 20, N. Y.

SINCLAIR

Lubricants for Industry

FINEST CRUDES + EXPERT RESEARCH and MANUFACTURING CONTROL = OUTSTANDING PERFORMANCE



LIFE INSURANCE EXPERTS PROVE FORD TRUCKS LAST UP TO 19.6% LONGER!

NO LONGER need you guess about which make of truck to buy! Now you can know, beforehand, *which* one of all five sales leaders has delivered the longest service, which has the longest life-expectancy! Ford!

And the proof is *certified* proof! Certified by the same scientific methods used by life insurance companies in computing their rates!

4,967,000 Trucks Studied. Wolfe, Corcoran and Linder, noted New York Life Insurance Actuaries, assembled the records of all trucks of the five sales leaders registered from 1933 through 1941—a total of *4,967,000* trucks! Then they prepared *truck* life-expectancy tables in the same identical manner in which they prepare *human* life-expectancy tables for life insurance companies.

Ford Wins! Up to 19.6% longer life for Ford Trucks! Up to 19.6% longer life than the four other sales leaders! That's what the certified truck life-expectancy tables prove! The reason? Ford knows how to build trucks to last longer. Ford Trucks are built stronger! See your Ford Dealer today. He'll show you why it's good business to wait for the truck with the longest life-expectancy—Ford!

Certified proof

FORD TRUCKS LAST LONGER

The life-expectancy of a Ford Truck is:

13.1% longer than that of Truck "B"
3.2% longer than that of Truck "C"
7.6% longer than that of Truck "D"
19.6% longer than that of Truck "E"

OFFICIAL ACTUARIAL CERTIFICATE

Based on the application of sound and accepted actuarial methods to the actual experience as measured by truck registrations, we hereby certify that, in our opinion, the accompanying table fairly presents the relative life-expectancy of the trucks involved.

WOLFE, CORCORAN AND LINDER
Life Insurance Actuaries, New York, N.Y.

What's the Weakest Spot in a Backbone?

WHAT BACKBONE? Transportation's backbone. The concrete highways that cross our country . . . North, South, East and West. The paved airport runways on which great airliners must start and end each trip.

Like all vertebrate structures, this concrete backbone is most vulnerable at its joints.

Protect these expansion-contraction joints with *Flintseal**, and you gain in two ways. You greatly increase the service life of pavement. And you cut maintenance costs to the bone.

Why? Because *Flintseal* is a *rubber-bearing, thermoplastic* joint-sealing compound especially developed by Flintkote to give you *four* important advantages:

- Seals joints effectively against infiltration of moisture and other foreign matter through repeated cycles of expansion and contraction of concrete slabs.
- Adheres firmly to concrete . . . without use of primers. Remains extensible and compressible.
- Maintains resilience . . . does not become brittle and crack in coldest weather, nor will it flow in hottest weather.
- Can be melted and applied quickly and easily in equipment especially designed to permit safe, economical handling.

Get full details on application and equipment for Flintseal. Write today.

THE FLINTKOTE COMPANY
Industrial Products Division
30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.
ATLANTA • BOSTON • CHICAGO HEIGHTS • DETROIT • LOS ANGELES
NEW ORLEANS • WASHINGTON • TORONTO • MONTREAL
*TRADEMARK

Flintseal
HOT-POURED
JOINT-SEALING COMPOUND

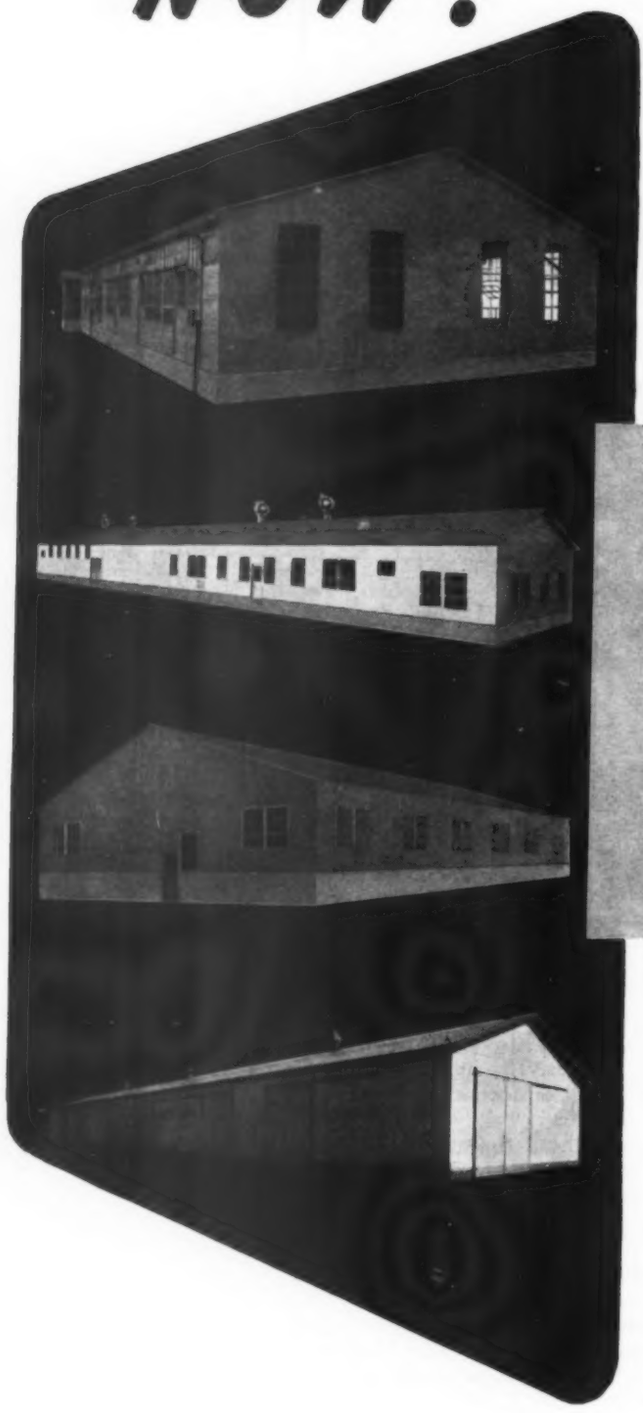
One of the special heating devices developed for Flintkote for controlled melting of Flintseal at specified temperatures. Smaller units also available.

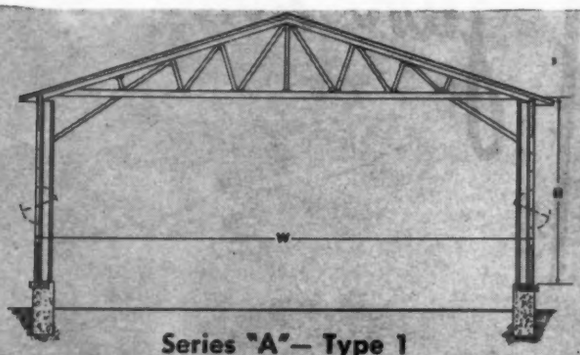
This pouring pot has a special shoe to fill and wipe the joint. A circulating hot oil bath in the jacketed kettle maintains Flintseal at pouring temperatures.

NOW!

Prompt Delivery of TRUSCON STEEL BUILDINGS

In sizes not exceeding 30′-0″ in width, 16′-1¼″ in height and lengths in multiples of 4′-0″.





Series "A"— Type 1

Standard Heights of Sidewalls	Standard Widths of Buildings
H	W
8′-1¼″, 10′-9¼″, 13′-5¼″, 16′-1¼″	8′-0″, 12′-0″, 16′-0″, 20′-0″ 24′-0″, 28′-0″, 30′-0″

The Answer to your Needs for Additional Buildings RIGHT NOW!

● Meet today's needs for more enclosures by building or enlarging with Truscon Standardized Steel Buildings. Standard designs, prefabricated, highly versatile and adaptable. Features include fire protection, permanence, ease and speed of erection, low upkeep, quick dismantling and re-erection, low cost and high investment value. Buildings are available with either interlocking painted steel or 18 gauge 1½ inch Ferrobord roof with insulation and waterproofing. Truscon engineers will give you experienced planning help for any need—write now!

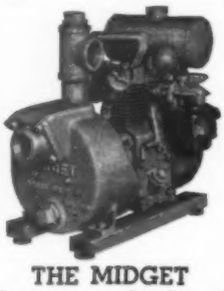
TRUSCON STEEL COMPANY
Reg. U. S. Pat. Off.
YOUNGSTOWN 1, OHIO • Subsidiary of Republic Steel Corporation

Manufacturers of a Complete Line of Welded Steel Fabric . . . Concrete Bars . . . Contraction Joints . . . Dowel Assembly Units . . . Curb Bars . . . Complete Steel Buildings.

PUMPS — *Engineered to Do the Job!*

THE HANDY PUMP

Fitted with pipe or common garden hose, this pump will lift water up to 25 feet. Delivers 8 gal. per min. at 40 lbs. pressure. Electric motor driven – self priming – weighs only 27 lbs.



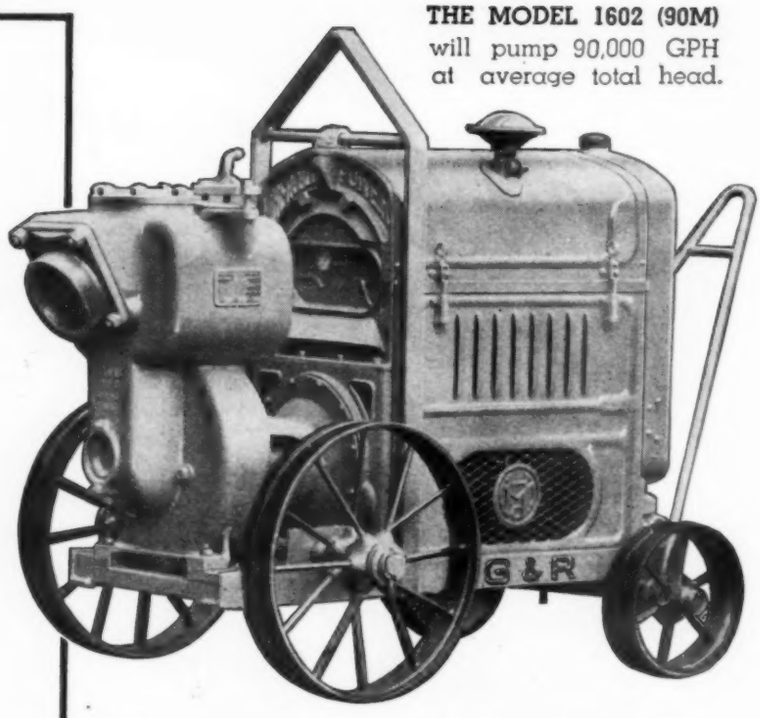
THE MIDGET

The Midget can do hundreds of handy pumping jobs. 3000 GPH at 20 ft. head, 5 ft. suction lift; – and it weighs only 60 lbs.

THE NEW ODORLESS SANITARY CLEANER (O. S. C.)

A modern apparatus for cleaning septic tanks, vaults and cisterns. Shipped complete ready to mount on standard truck chassis, 158 to 161 in. length. Septic tanks of 1000 gallon capacity cleaned in 20 minutes. Approved by public health officials. Write for bulletin 7-ST-11.

THE MODEL 1602 (90M) will pump 90,000 GPH at average total head.



Gorman-Rupps are the simplest, most rugged design of any self-priming centrifugal pump made. They are engineered to give the best performance possible under any and all conditions and to assure continuous trouble-free service for a long period of time.

Faster Priming – more efficient – just start the motor and you start the water without making any adjustments.

Will not clog – nothing to cause stoppages – no valves, vents or ports – no tubes – no orifices – no clean-out plates.

Whatever the size or application from 3000 GPH up to 25,000 GPH you can do the job more profitably with a dependable Gorman-Rupp Blue Pump.

Write for further information or contact your nearest distributor.

THE GORMAN-RUPP COMPANY

Gorman-Rupp Pumps — Unsurpassed for Pumping Fast

323 N. BOWMAN STREET • MANSFIELD, OHIO

Proper balance of Power

. . . that's why Heil Cabledozers move more dirt and reduce costs

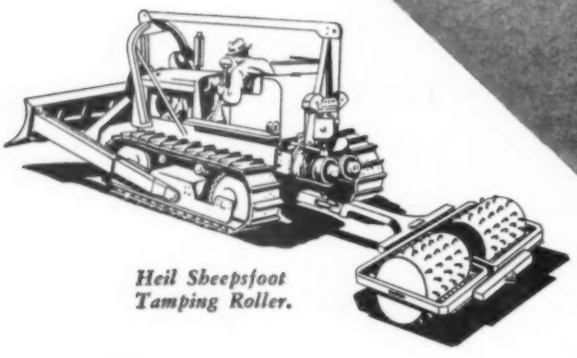
Get in and dig — that's what your tractors have to do if you are going to move dirt economically. They must make full use of their tractive power.

Taking this into account, Heil designed its Cabledozers for International Crawler Tractors so that tractor balance is not disturbed in any way. There is no nosing down or rearing up. Instead, you get full driving and penetrating power at the blade.

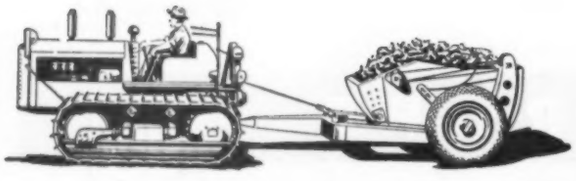
That is what Heil calls proper balance of power and — that is why famous Heil Cabledozers cut cleanly, and smoothly, and move more dirt.

Literature describing many other Cabledozer advantages is available. Write for it or see your International Industrial Power distributor.

R-87



Heil Sheepsfoot Tamping Roller.



Heil 3½ yard, 2-wheel rear-dumping Cable Scraper.

THE HEIL CO.

GENERAL OFFICES • MILWAUKEE 1, WISCONSIN

For Longest and Best Service...

UPSON-WALTON
LAYRITE (PREFORMED) ROPE

WHEREVER installation and maintenance costs are high (and that is practically everywhere) U-W Layrite wire rope can help lower them. And in almost every case where wire rope is used, Layrite will do a better job.

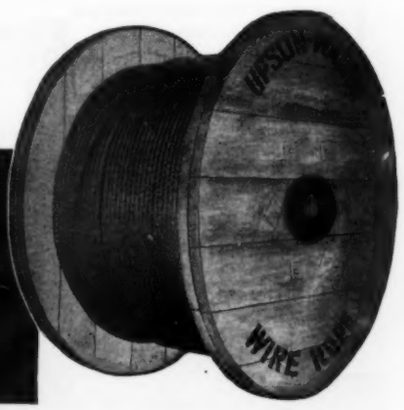
For rotary drilling lines...mining machine ropes...all kinds of earthmoving and excavating machinery...grab buckets, shaft hoists, cargo falls—the instances where Layrite does a better job are as broad as all industry.

Because every single strand in a U-W Layrite rope is *pre*formed to the shape it will take in the rope before it ever comes in contact with another strand, Layrite is a *permanent* rope; it's been constructed to hold its shape until the wires themselves wear out; it is safer and easier to handle . . . consequently it saves valuable time on the job in installation and saves expensive maintenance where shorter-lived rope would require re-rigging.

For best service on any job, specify *U-W Layrite Preformed, Perfection Grade.*

All Upson-Walton Products Available Through Your Local Upson-Walton Distributor

Established 1871



THE UPSON-WALTON COMPANY

Manufacturers of Wire Rope, Wire Rope Fittings, Tackle Blocks

MAIN OFFICES AND FACTORY: CLEVELAND 13, OHIO

114 Broad Street, New York 4 — 737 W. Van Buren Street, Chicago 7 — 241 Oliver Building, Pittsburgh 22

CHOOSE WISELY! Snow removal equipment is one of your most important purchases—in terms of cost and community winter safety.

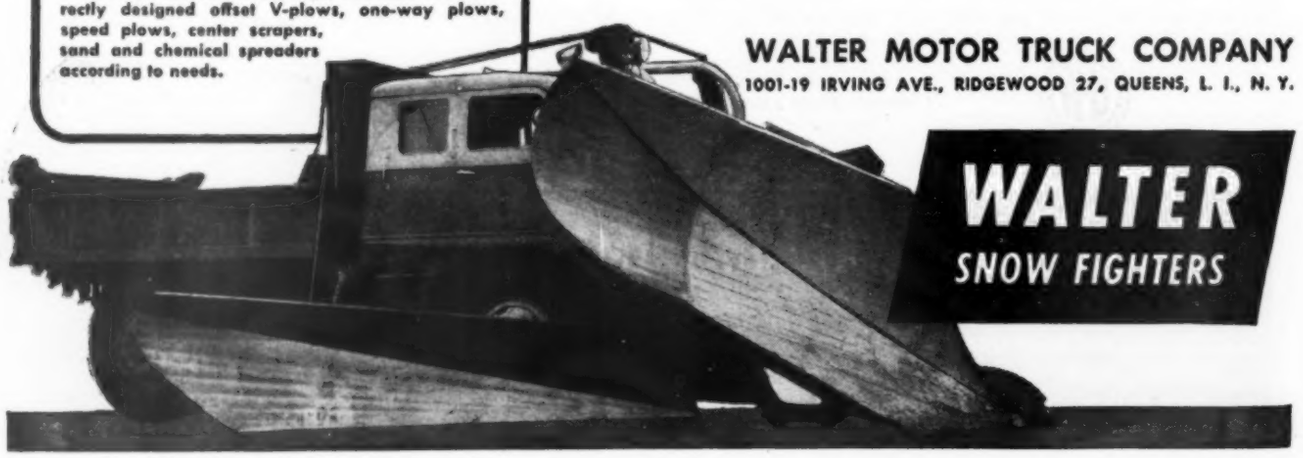
Get the most from your investment by choosing Walter Snow Fighters—the fastest, surest, most thorough snow removal method under all winter conditions. And get the year-'round bonus of Walter's great power and non-slip traction for maintenance and hauling jobs—on or off the road.

ORDER EARLY! The peak demand for Walter Snow Fighters is just ahead. Order NOW and let us schedule your equipment for delivery before snow-time. Your Walter distributor is glad to discuss your needs and explain the many valuable Walter advantages. Detailed literature sent upon request.

Advantages of WALTER SNOW FIGHTERS

- No slipping, stalling or wheel-spinning, because the exclusive 4-Point Positive Drive delivers power to each of four driving wheels according to its traction at any instant.
- Clear 28 foot widths in one run; clear at speeds up to 30 mph.; throw snow far to the side, making widening out easier; buck through deepest drifts.
- Models from 125 to 350 hp., available with correctly designed offset V-plows, one-way plows, speed plows, center scrapers, sand and chemical spreaders according to needs.

WALTER MOTOR TRUCK COMPANY
1001-19 IRVING AVE., RIDGEWOOD 27, QUEENS, L. I., N. Y.



SERVICE
FROM COAST TO COAST

The type of work that is done by a shovel, crane or dragline places it in a class by itself when it comes to taking punishment. Heavy excavating, overloading, improper care all take their toll. We at LIMA go the limit to build equipment that will withstand a normal amount of rough usage but regardless of how well a machine is built, there are times when parts must be replaced. Our interest in a customer does not end with the sale and delivery of a shovel, crane or dragline. We are ever ready to serve you at a moments notice as long as the machine is in service. A complete record of each machine we build is preserved so that when a part is ordered the customer can be sure that it will fit accurately. Parts are shipped the same day the order is received whenever possible. Special attention will be given to your request for parts service from headquarters located in the cities shown on the above map.

LIMA LOCOMOTIVE WORKS, INCORPORATED

Shovel and Crane Division · Lima, Ohio, U. S. A.

THE LIMA DIAMOND

FOR OVER 75 YEARS AN EMBLEM OF QUALITY WORKMANSHIP

LIMA

LIMA

Capacities . . . SHOVELS ¾ YARD TO 5½ YARDS · CRANES 13 TONS TO 100 TONS · DRAGLINES VARIABLE

Economical Versatility

Easy-handling MM Industrial Tractors have balanced weight and power, a wide range of speeds and front or rear power take-off for the efficient handling of a wide variety of attachments. Low operational and maintenance cost and easy accessibility for servicing recommends MM for use with: pull-behind and side-mounted mowers, V-type and reversible plows, bulldozers, rotary brooms, flushers, bucket or fork loaders, winches and cranes.

The MM 27 H.P. RTI and 49 H.P. UTI Industrial Tractors are BUILT TO DO THE WORK *conveniently, safely, economically.*

See Your MM Dealer — Distributor or Write

MINNEAPOLIS-MOLINE MM MODERN MACHINERY

MINNEAPOLIS-MOLINE
POWER IMPLEMENT COMPANY
MINNEAPOLIS 1, MINNESOTA

I DOUBLED my truck's earning power

with a

DETROIT AUTOMOTIVE

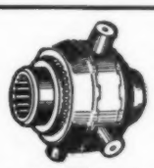
Thornton Drive

"Yes, sir! I really hit a gold mine when I put Thornton 4-Rear Wheel Drive on my medium truck! That Thornton Drive has made my medium truck into a heavy hauler—a powerful, high capacity, rugged 6-wheeler. It has doubled my profits by doubling my payloads and increasing my performance by nearly 100%—yet I still have the operating economy and advantages of a medium truck!

"Figure it out yourself. My medium truck had a G. V. W. of 14,000 pounds. When equipped with a Thornton Drive, that same truck has a gross of 30,000 pounds. This additional equipment increased my body and chassis weight by only 78%. Therefore, the payload was more than doubled.

"And performance? My Thornton Drive, using 3 NoSPIN Differentials*, gives me *two* driving axles, *four* driving wheels—each with powerful, positive, independent drive. With that increased traction plus the Thornton Drive's rugged walking beam springs, I can *get out* of mighty tough places—do jobs I'd never attempt otherwise. My performance is 100% better both on the road and on those rugged off-the-road jobs.

"Yes, sir—any trucker can hit the profit jackpot—*double his earning power*—by converting his medium equipment to heavy capacity, high performance trucks with Thornton 4-Wheel Drive!"



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***NoSPIN Differential Is a Profit Saver!**

NoSPIN is standard equipment in the 2-speed gear case of the Thornton Drive, providing positive drive to both rear axles and eliminating axle fight over any terrain.

When NoSPINs are also used in both driving axles (optional), positive drive is provided to *all four* rear wheels.

NoSPIN Differentials are also available for single axle trucks.

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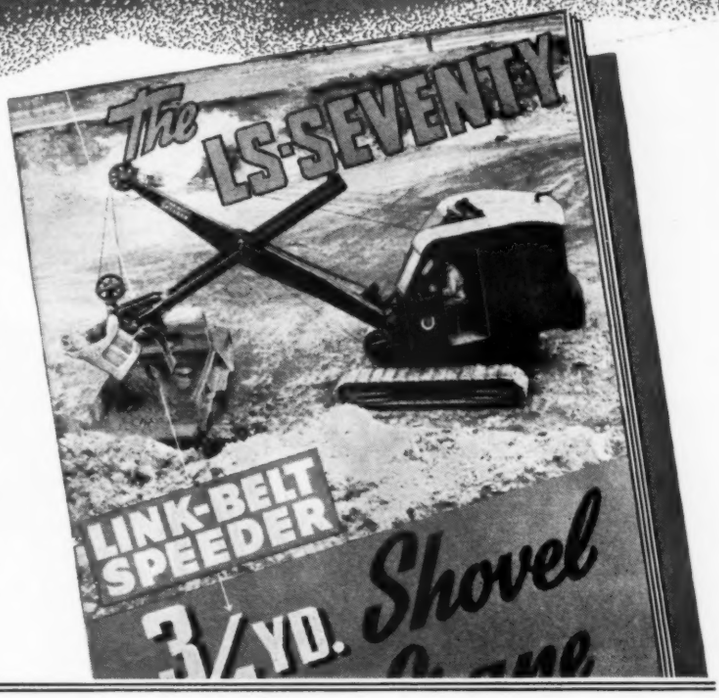
OF THIS NEW CATALOG

DESCRIBING THE LINK-BELT SPEEDER LS-70, ¾ YARD Shovel-Crane



This catalog — just off the press, describes in full detail and illustrates the numerous distinctive features of this ¾ yard Shovel-Crane. From this "word-and-picture" story you will readily understand the outstanding performance this machine is now giving in widely separated areas, under the many varying conditions of service. You will easily accept the promise of long life and trouble-free operation, written in terms of advanced design, better materials and precision construction found in those locations where an experienced user will first look for them.

Send today for your copy. Become familiar with the features, the capacities, the appreciations of this new, advanced, versatile machine, one of the twenty-five models, ranging from ⅜ yd. to 3 yd. capacity, and offering a size and type to suit practically every requirement for excavation, construction and materials handling.

10,815

In the line of Link-Belt Speeder Shovel-Cranes there is a type and size to meet every requirement. And located near you is a Link-Belt Speeder distributor, informed, experienced and equipped to give you valuable aid in selecting machinery for your particular needs, and in keeping your equipment in top-notch operating condition.

The combination of skilfully designed, precision-built Link-Belt Speeder Shovel-Cranes, with interested, capable and cooperative distributor service, is your assurance of profitable performance.

LINK-BELT SPEEDER

LINK-BELT SPEEDER CORPORATION, CEDAR RAPIDS, IOWA

Builders of the Most Complete Line of SHOVELS-CRANES-DRAGLINES

says Combs Construction Company, Chattanooga, *about* MICHIGAN

This MICHIGAN owner, in a letter to Nixon Machinery & Supply Co., Chattanooga, goes on to say

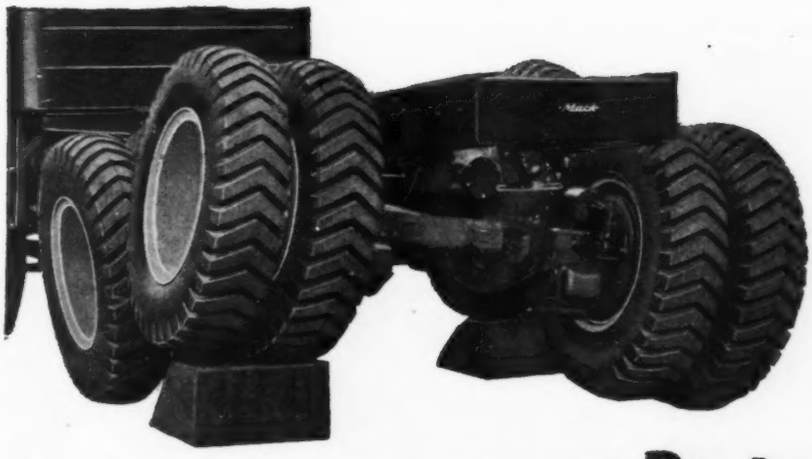
". . . we have never gone wrong buying equipment that you recommend. Your claims were, if anything, conservative.

"We have used our MICHIGAN as shovel, back hoe, clam, dragline and in steel erection as a crane. In all operations it has proven a very efficient and economical machine. Operating and maintenance costs have been extremely low. Its mobility and flexibility, plus its other features has convinced us that it is an essential part of our equipment fleet.

"We recommend the MICHIGAN Model T-6-K, without reservations, for any work within its capacity."

Full details about the complete line of 3/8 yd. and 1/2 yd. convertible MICHIGAN Mobile SHOVEL-CRANES are available on request.

MICHIGAN
POWER SHOVEL COMPANY
BENTON HARBOR, MICHIGAN



For GOOD Going on Bad Ground

Unmatched flexibility...without complications of design or localized strain...is an outstanding advantage of Mack's Balanced Bogie for six-wheeled trucks and tractors.

- Long, many-leaved springs freely trunnioned to the frame and yieldingly attached to the axles by huge rubber Shock Insulators assure fully flexible suspension. Wheels conform freely to road irregularities without the slightest twisting stress upon the frame. Even when traversing rough ground which causes the axles to slant in opposite directions the frame maintains its proper midway position. The suspension also maintains positive alignment of the axles for true tracking either straight ahead or on curves.
- To its inherent flexibility the Mack bogie adds the benefits of equal traction, even tire loading and uniform braking on all four wheels--regardless of road conditions. Because of its simple, sturdy construction and balanced stress distribution maintenance is greatly reduced.
- The Mack bogie is built complete in Mack factories. Its advanced and simplified design is further evidence of the forward-looking engineering that goes into the making of a Mack.

Hauling 20 yards of cinders for **United Carting Co. of New York City,** this Mack six-wheeler is proving an adaptable performer both in congested city traffic and on runs to outlying sections. It's one of 18 Macks operated by this company, whose experience with Mack performance dates back to 1916.

Mack

since 1900, America's hardest-working truck

Mack Trucks, Inc., Empire State Building, New York 1, New York. Factories at Allentown, Pa.; Plainfield, N. J.; New Brunswick, N. J.; Long Island City, N. Y. Factory branches and dealers in all principal cities for service and parts. In Canada, Mack Trucks of Canada, Ltd.

Trucks for every purpose

B262-2

5262-3

Where traction is a must—

THIS TIRE IS TOPS!

GOODYEAR's great Sure-Grip is the champ on drive wheels because it has pull-ahead traction like no other work tire. The *open center* self-cleaning tread keeps each lug bar *completely* separate. So *each* lug bites in deep, takes firm grip with minimum slip, pulls sure and steady in *any* going.

That's why the Sure-Grip is first choice wherever pulling power is the first need. And when you add in the low-cost, long-life performance typical of *all* Goodyear job-proved tires, you see why Goodyears *stay* first choice — why year after year, *more yards are moved on Goodyear off-the-road tires than on any other kind!*

THE RIGHT TIRE FOR EACH JOB

Sure-Grip, All-Weather—T.M.'s The Goodyear Tire & Rubber Company

GOODYEAR

MORE YARDS ARE MOVED ON GOODYEAR OFF-THE-ROAD TIRES THAN ON ANY OTHER KIND

"21 inches is a Lotta concrete!"

★ Slab edge for 21-in. concrete runway—taxiway (not shown) will be 25 in. thick. Dowels are 24x2½ in. solid steel

Paving for the B-36

in Progress at Patterson Field, Ohio

After much weather delay the massive 330,000 cu. yd. runway and taxiway at Patterson Field, Ohio, are being concreted this summer, using five 34-E dual-drum pavers and a 650-ton per hour aggregate plant

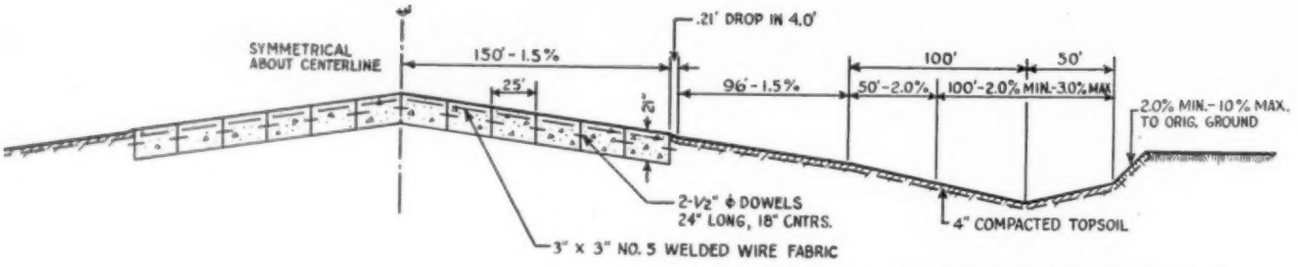
A BROWNED and brawny concrete finisher gave us the title for the review, which might be more formally described as "How W. L. Johnson Construction Co. is going about paving the largest and most massive single concrete runway in the world at Patterson Field, Dayton, Ohio."

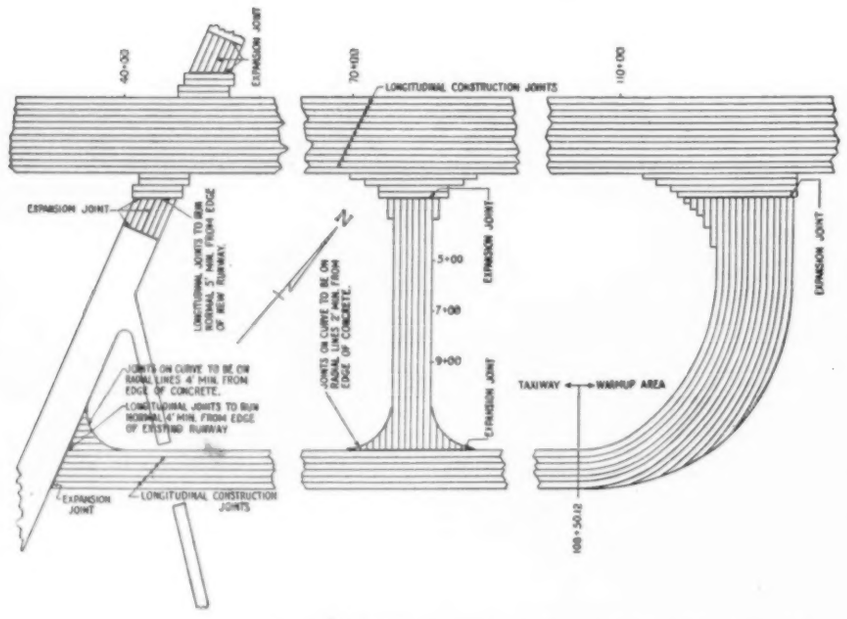
The 21 inches refers to the runway, the runway paving which is to be 300 ft. wide by 10,000 ft. long including 1,000 ft. clear zones at either end. Taxiways are even heavier—25 inches. The project [Aug. '46 "Roads and Streets"] comprises a single runway and a parallel 150-ft.-wide taxiway and connectors, now shown in more detail in Figs. 1 and 2.

All this is part of the Army Air Forces' program of preparation for the very heaviest bombers, of which the giant 6-motored 300,000-lb. B-36 with a hundred ships on order is the largest at the moment. Over 450,000 barrels of cement, supplied by eight cement companies, will go into the job along with 535,000 tons of aggregates. The concrete will cover 108 acres and contain a cubic yardage equivalent to 93 miles of 24-ft. road pavement 9 in. thick.

A Few Design Details

Designed for a maximum load of 150,000 lb. on a single wheel, the





★ Drawings on this page show details of runway and taxiway paving at Patterson Field

pavement includes several notable departures from familiar design practice. Concrete is being placed in 25-ft. lanes. Longitudinal joints are heavily doweled but not keyed. Transverse dummy contraction joints are spaced 28 ft. There are no expansion joints anywhere except where taxi strips intersect with the main runway or with existing pavement.

Dummy joints are formed by inserting a ½ x 3 in. premolded asphalt strip with top 2 in. below the surface. Grooves are then edged and sealed with Paraplastic rubberized asphalt compound. Longitudinal joints are edged to a ½-in. radius and filled with the same seal.

141,000 Heavy Dowels

Dowels for the lane joints consist of 2½ in. diam. solid rolled steel bars 24 in. long, each weighing 33 lb. Ends of bars are slightly tapered and dowels are oiled at one end but not hooded. Dowels also placed at construction joints. Expansion problems however are not expected because of the thickness and mass of the concrete, the dowels being for load transfer and for holding the system together. A total of 141,000 such dowels oiled against rust were stored on the job under canvas.

Dowels are loaded by hand on a small trailer and towed by a rubber-tired tractor. They are then threaded through holes in the forms and fitted into brackets which are clamped securely to the form bracing.

Reinforcing weighing 8.1 lb. per sq. yd. and consisting of No. 5 welded wire on 3-in. squares is specified, being placed 4 in. below the surface. Mesh is cut at a plant near the job, hauled to the pavers on trailers, unloaded (flopped over) by two men, lifted into place by six men. Concrete workers trample the mesh into position in the first concrete lift until accurately positioned and worked well into the soup.

Air Entraining Agent Added at Paver

Air entraining concrete is specified throughout, Darex being added at the paver. Since the concrete is placed in two lifts, this ingredient in theory isn't needed full depth. But omission from part of the concrete would have complicated the control problem on the lower lift. Actually ½ to 1% more air content is being obtained for the top lift than the bottom through the use of wetter concrete needed to expedite finishing.

Entrained air limits are 3%-6% and an average of about 3.5% is being obtained. The most difficult problem with the contractor has been to balance air content with the desired concrete yield per sack of cement in adjusting his mixes. Field tests of air content are made 6 to 8 times daily on a 10 or 12 hour run, using new testing equipment (Tarrant) which operates on the compressibility of air theory.

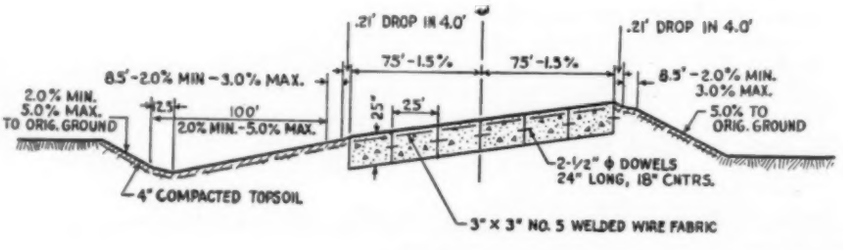
How Subgrade Is Reshaped

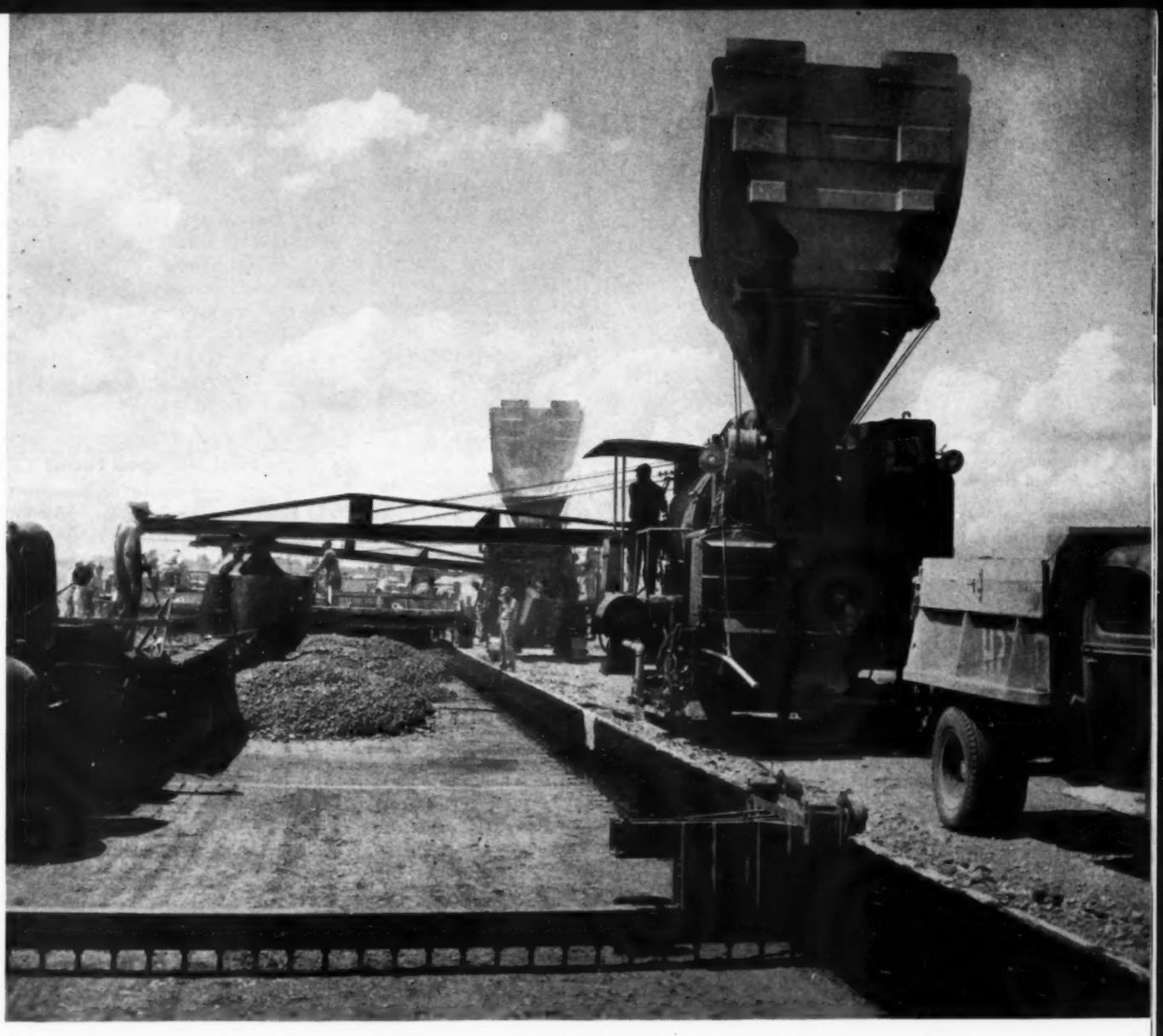
Approximately 4% of the grading was completed last year except for minor clean-up and delay on certain details. The 1947 paving operation is preceded by using one or more tractor-drawn scrapers as necessary to iron out rough spots, followed by tight blading with a motor grader fitted with an extra long blade (26½ ft.). Fitted with pavement or form rollers at ends for blading to exact depth in the final pass, this grader also takes a roll of excess material to one side in successive preliminary passes, aided by a towing tractor (see photo).

Forms are set and fine-grading completed with a second grader followed by a heavy towed screed. A tandem roller then gets in its passes, a scratch template checks the grade and she's ready for the concrete.

Five 34-E Pavers

Then comes the first concrete lift, 17 in. thick for the runway and 21 in.





★ Both skips up! This pair of dual-drum pavers plus two more pavers at a central plant is placing up to 240 c.y per hour

for the taxiway. The contractor began the season with three 34-E dual pavers along the forms, two helping on the first or deeper lift and the third paver handling the top lift. This method soon proved to be the limiting factor in production, yet no additional equipment could be brought into play alongside the forms due to space limitations. Added capacity was provided by cutting the form-side team to 2 pavers and setting up two 34-E dual-drum pavers as a stationary plant centrally located on the field, and hauling from them in dump trucks. As pictured here the pavers are located about 50 ft. apart on raised earth, boom and buckets being shored up out of the way. Mix water is supplied from a drainage pit to a high-level booster tank, then by truck to a supply tank spotted between the pavers.

A third paver was due to be installed in July.

Pavers are all 34-E dual Koehrings which have been mounted 6 in. higher than standard and are operated along raised ground so concrete buckets can clear the high forms. Pavers working along the forms are each equipped with a second air cylinder for use in closing the bucket hopper before it returns, so that the bottom will miss the forms.

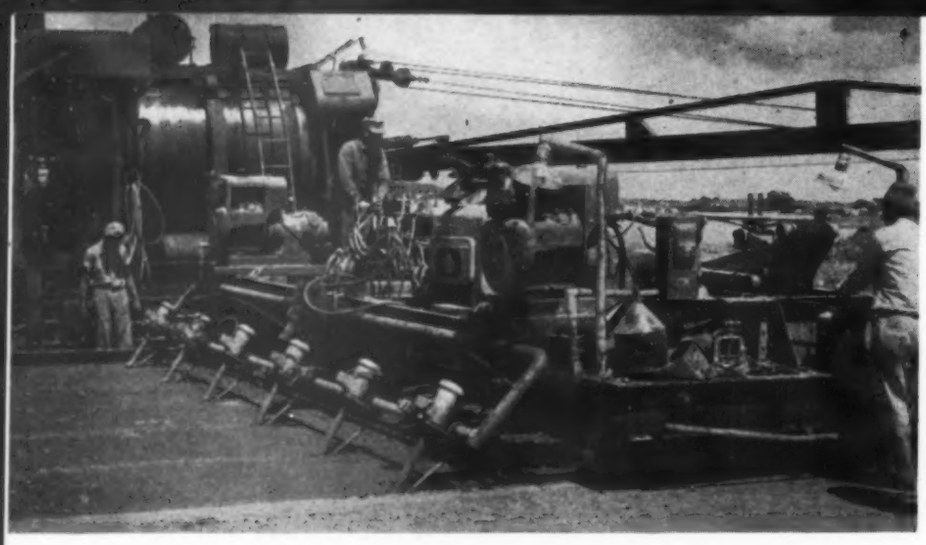
After much wet weather paving began June 19. During the first 33 elapsed days, in spite of frequent rains, 5500 lane-feet of taxiway and 15,000 lane-feet of runway were concreted in a single-shift work. The 4-paver set-up has approached 240 cu. yd. per hour production and with 5 pavers from 300 to 320 cu. yd. per hour is expected. Double shifts operation should boost daily progress to 4800 cu. yd.—about 8400 sq. yd. of runway or equivalent to 2½ to 3 miles of ordinary concrete road or 6 miles of single-lane road paving per day.

The centrally mixed concrete is hauled in plain steel-bodied batch trucks holding 2.8 cu. yd. per load. Specifications require that haul be limited to 20 min. duration and that the bodies be covered. No segregation problem has been encountered, this trouble being eliminated by use of air entraining concrete and careful mix control.

Concrete from the central plant is dumped on the near side of the lane by turning and backing trucks to the edge of the adjacent completed slab, trucks coming to rest against a steel chock block. Concrete for the far side is dumped by backing trucks on to a low-bed trailer drawn along the subgrade. Ten wet-batch trucks and 21 dry-batch (2-batch) trucks are kept busy, the latter making hauls up to a mile.

Three Finishing Units

The first concrete lift is struck off



★ Spud vibrators were gang-mounted on a heavy-duty spreader for placing the lower lift

by a heavy Blaw-Knox spreader on which is mounted a gang of six spud vibrators (Viber manufacture) powered from a motor mounted on the machine.

After placement of mesh and the top lift two Jaeger-Lakewood finishers go to work, the first one having a Jackson tubular type vibrator bar for vibrating the 4 in. top lift only. Two men with long-handled wood floats work sparingly behind the dummy joint machine, followed by a bridge-mounted burlap drag.

The contractor devised special shields for inserting dummy strips, the shield bars having flared tops intended automatically to form rolled edges and minimize if not eliminate hand edging. However it proved almost impossible to hold the shields at exact height. The shields are being lifted an inch or so in the clear after concrete has begun to stiffen, and on removal the edging job is done by hand as usual.

Concrete is being membrane cured (Truscon) using a mechanical spray bar on a frame made by the contractor.

Barges Expedite Lane Moves

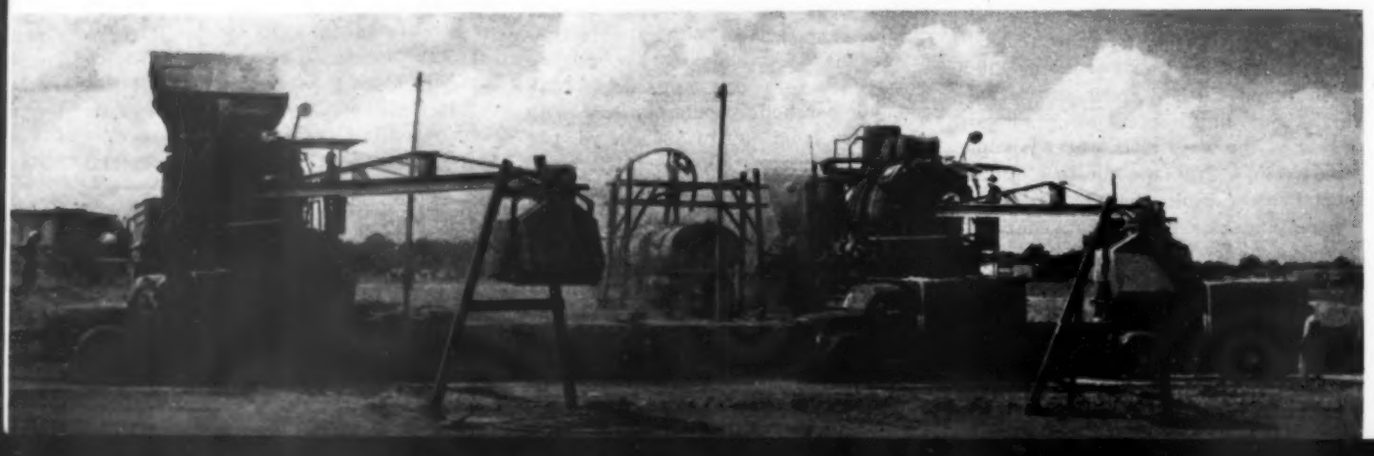
Moving 25-ft. finishing equipment between lanes is quite a job normally. The Johnson firm cuts moving time to an hour or less for the four heavy form-riding units and the lighter bridges, by means of two specially built tractor-drawn steel sledges. Designed to approximately the same height at the forms, the sledges are drawn into position adjacent to the end of a lane, the units towed on, moved, and drawn onto the new forms by the tractor.

Special L-Shaped Forms

One of the features of the job is the use of paving forms, specially manufactured by Heltzel for this job. Built with 21 and 26 in. sides, for forming either of the two slab thicknesses specified, form sections are 12 ft. long and include special flanges and brackets to receive and hold the heavy dowels. Sections weigh over 800 lb. each when clean. These forms, which have proved amply strong and well designed from the contractor's standpoint, are hauled on small rubber-tired trailers and handled by a special front-end lifting device mounted on a wheel tractor. This machine also helps pull pins, prys

★ Centrally mixed concrete is dumped from the adjacent slab, via steel chock block pictured; or from a low-bed trailer drawn along between the forms

★ Two more 34-E duals, used as a stationary plant to supplement the pavers at the grade. Third paver due in



★ A specially-made front-end lifting device, mounted on a wheel tractor, is being used to pull, handle, and load forms (broken down on day this photo was taken)

forms loose from the slab and loads the panels for the moveup. 4,000 lin. ft. of forms were provided for this project.

650-Ton Aggregate Plant

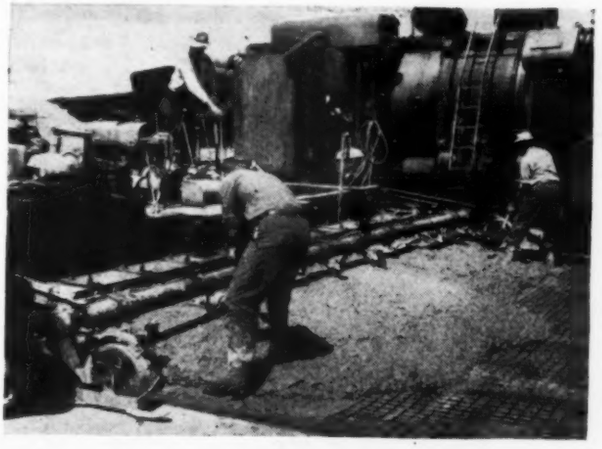
Materials production here is also geared to a fast pace. The plant is currently being worked two 8-hr. shifts to supply a 10-hr. to 12-hr. paver run. Cement is rail delivered in cement cars, loaded into cement trucks via bottom-dump hoppers and trucked to elevators at the batch plant.

The four aggregate sizes are produced under a subcontract by Central States Construction Co. of Logan, Ohio. Their plant, capable of 650 tons per hour, consists of the following elements: a 4½-yd. Lima dragline with Hendricks bucket loads from a water-filled gravel pit into three Heil 14-yd. bottom-dump wagons, which deliver to a central receiving hopper. Oversized material passes successively through a jaw and a roll crusher, thence through separating screens on to longitudinal belts from which material for the four sizes is belted laterally to high-level washing screens and into stockpiles. The sand also passes through a pair of classifying chambers, and a small quantity of the fines in turn is run through a special ball mill, in order to meet the rigid specification for minus-100 material.

The four stockpiles lie over a long tunnel, into which material is bulldozed on to a 600-ft. x 24 in. belt via a series of 24 control gates. This belt is where the Johnson end of the operation takes over. It passes through 400 ft. of tunnel and up 200 ft. of incline to the batching bins. The belt has quite a history, by the way. It was manufactured originally for use on Friant dam in the west, then saw service at the Hanford (Wash.)

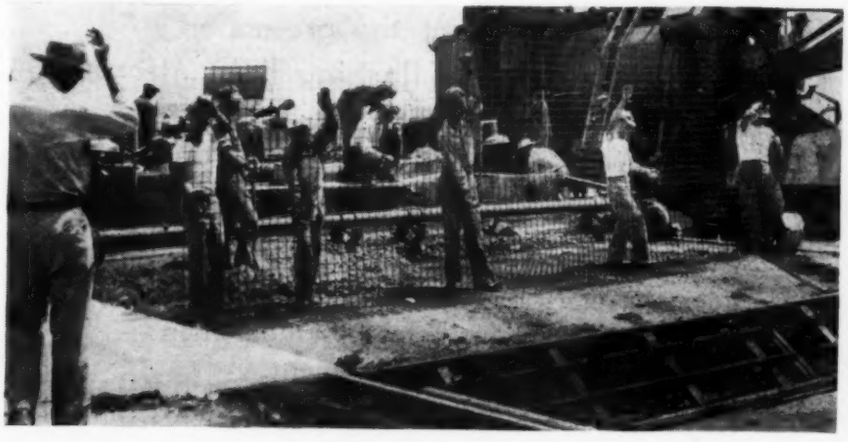
★ Fine grade preparation includes blading, a strike-off template, rolling, scratch testing, final sprinkling

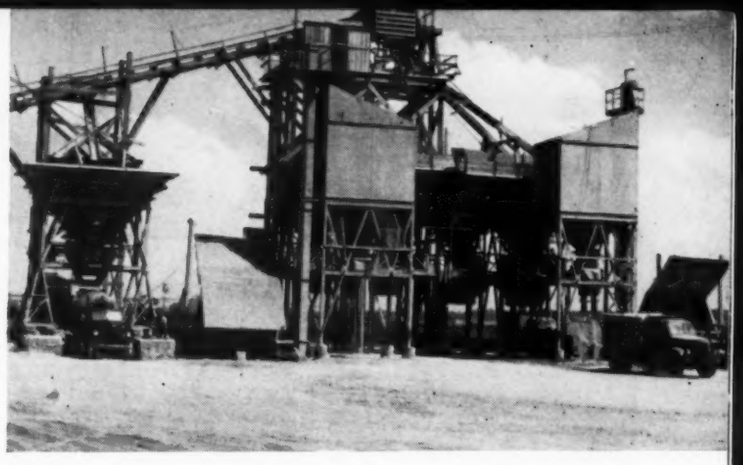
★ Tubular vibrator on second spreader, for the top lift. Spud vibrators are used at construction joints, lane ends, etc.



★ How reinforcing steel is being handled from a light trailer. Note forms for lane end

★ The now-familiar hooded mechanical spray bar for curing application is in evidence at Patterson field





★ A sub-contractor put in this crushing, washing and screening plant for the four aggregate sizes. Material drops on the prime contractor's belt via a 400-ft. tunnel having 24 doors

atomic energy project.

The batching plant is capable of 280 37.4 cu. ft. batches per hour. It consists of four 100-ton double-compartment batch bins, one each for the four aggregate sizes. Flanking these bins are two Heltzel bulk cement bins. Aggregate bins each have manually operated double weighing hoppers. Referring to photos, the two outer aggregate bins (Blaw-Knox) load ¾-in. and 1½-in. aggregates into in-coming trucks via a single hopper, trucks then take cement and loop back under the inner pair of bins (Heltzels), taking on 3-in. stone and sand via another hopper. Trucks get cement at either of the cement bins before or after looping.

A third cement elevator and another batch bin are located near the main plant, for supplying ready-mixed three-aggregate concrete when needed for sewer manholes and miscellaneous purposes.

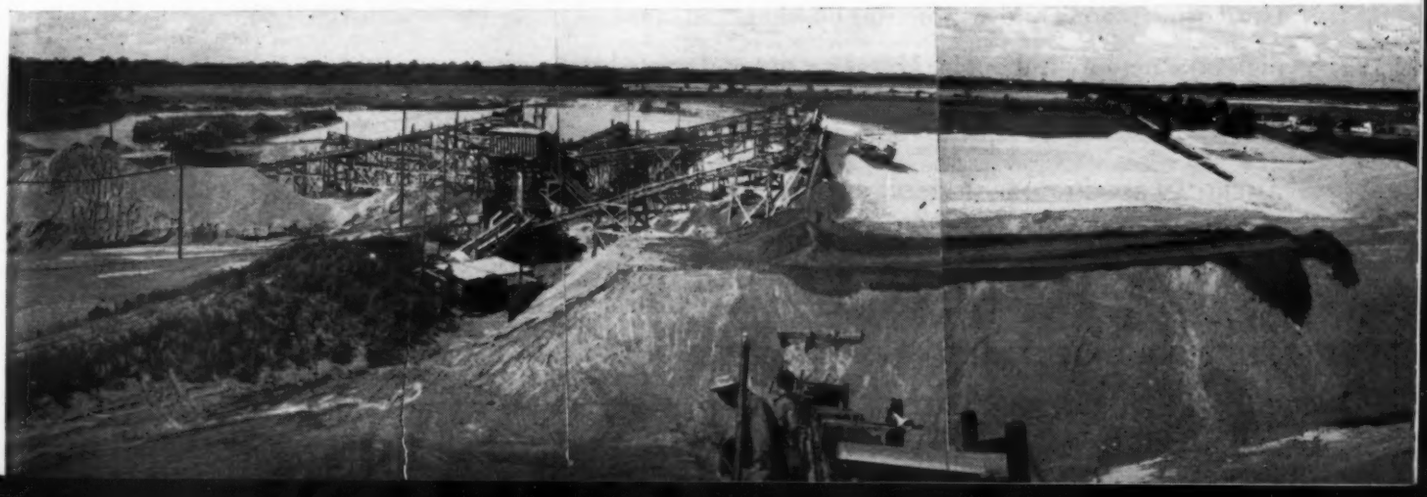
All crushing, washing and belting are powered by individual 220/440 volt motors via transformer from a utility line.

Three Stone Sizes

Concrete is made from three sizes of crushed, screened and washed gravel and one of sand. Gradation limits are specified for each size as well as the combined coarse aggregate, in accordance with good concrete practice. Stone sizes grade down from 3, 1½ and ¾ in., respectively, and special attention is given to control of fines. The designed 5½-bag mix has run around 63 water-cement ratio with 30% sand. Strengths at 7 days have tested about 600 lb. The combination of air entrainment control and routine testing and inspection on this job has required a staff of some 35 men.

★ Concrete aggregates all come from this wet pit, worked by a 4½-yd. dragline with perforated bucket. Three 20-yd. dump wagons take care of the 200 to 2000 ft. haul

★ Contractor's 650-ton-per-hour concrete aggregate batching plant—includes a 600-ft. rubber belt which has served on famous big jobs in the West



KING KHUFU had only *slave*-power with which to build the greatest of the pyramids. With engine-power, he might have saved a lifetime and the lives of 300,000 slaves.

Today, mightier and much more useful structures spring from dream to drawing board to reality in relatively short spans of time. Modern construction equipment powered by internal-combustion engines makes this possible. For today, the machine is the slave of man. Great dams, soaring bridges, towering buildings and broad highways are ours without backbreaking toil and wasted flesh and blood.

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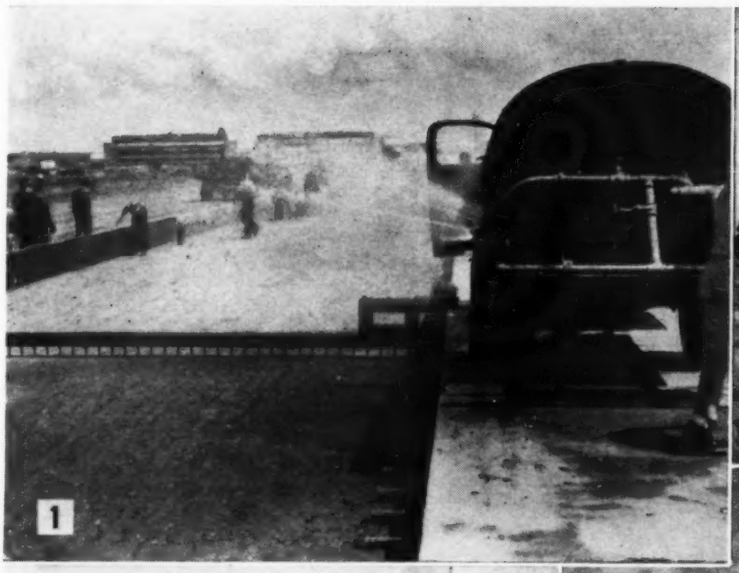

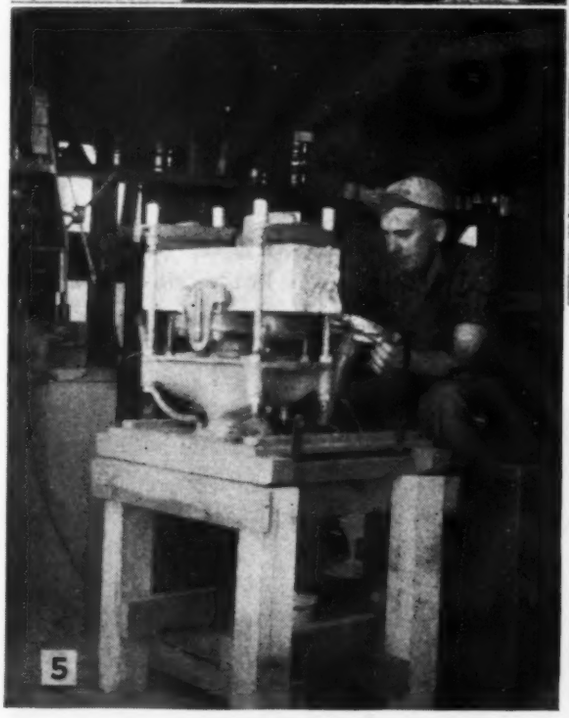

Miscellaneous Scenes Snapped at Patterson Field

1. How the subgrade is sprayed before paving
2. Johnson's water station for supplying pavers is fed by a 4-in. pump from a drain pit on the field
3. Handiest tote rig on the job—hauls heavy dowels, etc.
4. Making field check of air entrainment
5. Modern beam breaking equipment is set up in the U. S. Engineer's materials lab near the project
6. Special shields were made for pressing premolded dummy strips. Shield being formed with a T-shaped top intended to obviate band edging. This detail not entirely satisfactory

1+1=3

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1 TWINDUAL* ROLL CRUSHER
3 STAGES OF REDUCTION

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WRITE FOR BULLETIN No. 682

●

UNIVERSAL ENGINEERING CORPORATION
631 C Avenue, N.W. **Cedar Rapids, Iowa**

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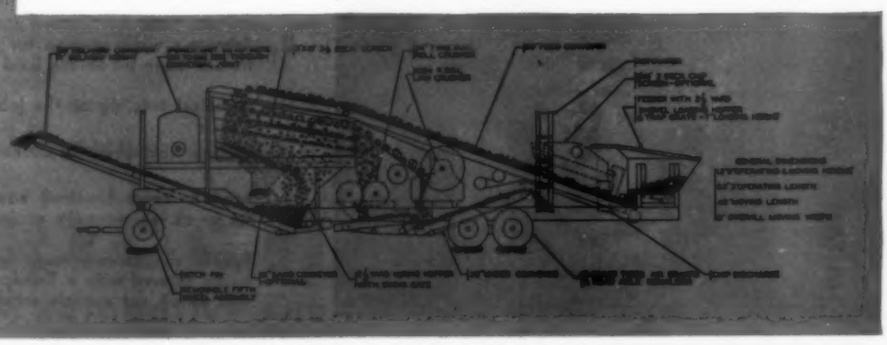


★ Special forms of "battleship" construction—this fellow is removing brackets which hold dowels while concrete sets

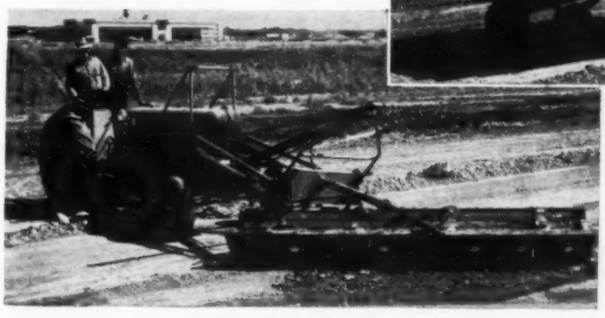
Soils Control a Problem

A word about grading and drainage, largely completed in 1946. The site lies in a flood plain underlain by gravel pockets. Because of the high prevailing water table it was necessary to install well points during working of various areas. About 38,000 lin. ft. of concrete pipe ranging 12 to 84 in. diam. was installed for storm water.

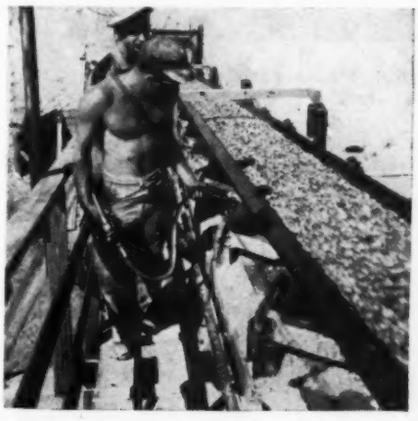
The grading, while utilizing an ample supply of granular materials, turned into one of the most difficult soils and compaction control problems in the memories of the U.S. engineer personnel. The problem lay chiefly in the lack of uniformity of the soil. Originally the specification was for 95% compaction, modified AASHO, under runway areas. But it soon became evident that achievement of this density would require that the contractor pass top-lift material through a mixer in order to get the uniform blend of binder and coarser materials needed. A 90% density was then decided upon, which permitted the contractor to proceed with informal blade mixing of finer and coarser pockets encountered.

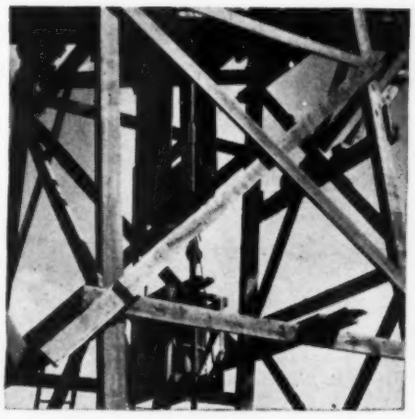
A sieve analysis literally had to be run for each sample taken. The great variation in gradation made necessary some 300 sieve analyses from which more than fifty separate moisture-density curves were plotted, so that some one curve would approximately fit any gradation met. Sometimes the samples tested nearly 50% retained on a No. 10, and at other times ran quite low in larger sizes, this fluctuation naturally resulting in great differences in the permissible moisture. Samplings were taken about 250 ft. apart along each work strip, using the sand picnometer test or the oil method.

★ At 800 lb. per section, forms weigh up heavy in a hurry. Handy trailers toted them



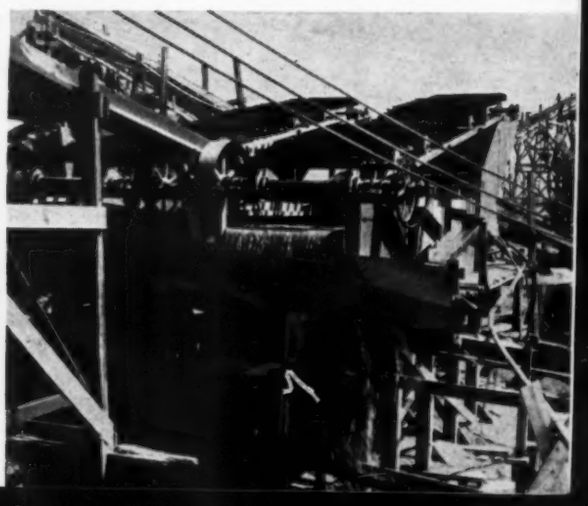
★ A specially-made front-end lifting device, mounted on a wheel tractor, is being used to pull, handle and load forms (broken down on day this photo was taken)

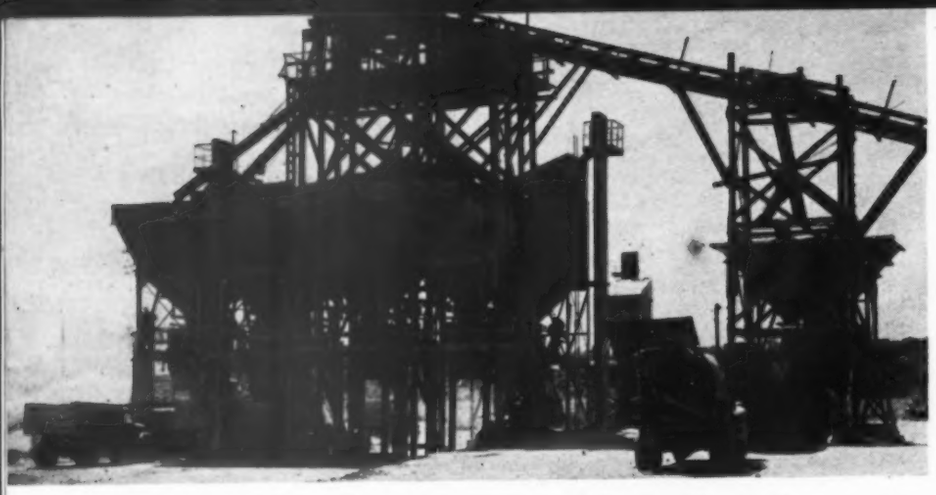




★ Grease guns are used systematically all over the crushing plant. (Right): Counter-weighed loop for taking up slack in the long belt

★ A ball mill (left) and a pair of classifiers (right)—part of the sub-contractor's sand plant





★ Two pairs of 100-ton bins feed aggregates to split hoppers, bins at left loading two sizes to trucks going in. The two bins at right supply trucks after they hvae looped and taken on cement

★ This guy is a batch truck checker and dispatcher. He also looks over the partitions in the trucks and eagle-eyes things generally

★ One of two heavy sledges, used to tow finishing equipment or lane changes

Sub-base and base material were placed in 9-in. maximum lifts and rolled with sheepsfoot, pneumatic and flat wheeled rollers, the latter being used for the top 3 inches.

Acknowledgments

The foregoing project is being built for the U.S. Army Air Forces Air Materiel Command at Patterson Field by the U.S. Engineers, Louisville District. W. L. Johnson Construction Co. of Columbus, Ohio, is the contractor, the original contract being for a consideration in excess of four million dollars. Ralph Beerbower is contractor's superintendent. F. G. Dyer is project engineer.

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CAA Studying Effect of New Landing Gear

Single-runway airports may be requested by local sponsors of federal-aid airports if they consider that the new cross-wind landing gear justifies such a change, announces T. P. Wright, Administrator of Civil Aeronautics. A "full-out consideration" of the effects of this new CAA development on the whole airport problem now is under way.

The program for the fiscal year ending June 30, 1949, on which the first planning efforts are now beginning, will be based upon a comprehensive study of the possibilities raised by the swiveling gear, which makes possible airplane landings on a single runway even when the wind is blowing straight across the runway. CAA has accepted delivery of two planes equipped with the experimental gear it sponsored, but the gear has not yet been subjected to extensive service testing.

Plans for the Interstate Turnpike, which would extend the Pennsylvania Turnpike into West Virginia, Ohio and Indiana, are advancing. Pennsylvania's legislature has passed a bill creating an interstate Turnpike Commission and West Virginia and Indiana have indicated support. An Ohio toll road bill has been killed, however. Another toll road proposal, in New Hampshire, also passed the legislature and has just been signed by the governor. This $7½ million project calls for direct state financing instead of private sale of bonds, which had roused strong opposition.

* * *

These actions are viewed as danger signals by many highway user groups. With taxation of the motorist at new peaks, the argument that tolls are needed to pay for better roads is unconvincing to many highway transportation experts.

"THE SIGN OF EXTRA SERVICE"

The Dozer Never Sleeps

There seems to be no limit to the number of jobs that little Cletrac Imp dozer can do. Why, it seems that every day we find some new job it fits to a "T".

It's been a real time and cost saver, and our Oliver "Cletrac" dealer really rang the bell when he said it would be a "handy man" for our work. He happened to be out one day when we were digging a foundation and remarked about the amount of heavy equipment we had. "You know," he said, "we've got a little unit that might save you a lot of time and money. It's a small hydraulic bulldozer that mounts on the Oliver HG . . . the smallest track tractor in the field. We call it the 'Imp.' It's small enough to do a lot of those jobs without the higher operating costs of a big tractor-dozer unit. And you can get it into places where the big tractors can't operate so you can eliminate a lot of hand labor."

It sounds good to me and it's proved even better. That Oliver "Cletrac" dealer sure has a lot of ideas that make a job easier. He's a good man to know.

Cletrac

a product of

The OLIVER Corporation

Industrial Division: 19300 Euclid Ave. • Cleveland 17, Ohio

This one-man, International tractor and scraper unit moves 100 yards of earth to the fill in an hour! It's on a big road-building job for a logging company in the mountains of northwest Washington.

The International TD-18 Diesel has the power to lug its matched scraper without assistance, even through this hardpan and gravel. It has the maneuverability and secure footing to handle the load on steep grades as well as on the fill.

A lot of earth gets moved at minimum cost for labor, fuel and maintenance under these circumstances. That's why the demand for International Crawlers and matched earth-moving equipment becomes greater and greater every month.

Ask your International Industrial Power Distributor for the interesting facts about this and other tractors in the complete International line. Let him help select the power and equipment you require.

Industrial Power Division

INTERNATIONAL HARVESTER COMPANY
180 North Michigan Avenue Chicago 1, Illinois

INTERNATIONAL POWER

CRAWLER AND WHEEL TRACTORS • DIESEL ENGINES • POWER UNITS

City Street Programs

City engineers are in midst of busy year of street repair, resurface and reconstruction

BANGOR, Maine—James L. McLeod, city engineer, reports: placing 62,000 sq. yd. hot asphalt on old concrete, to cost $75,000 and be applied by city forces; also planned is 36,000 ft. of streets involving heavy excavation, drainage, gravel base, surface treatment.

Wichita, Kansas—From L. K. White, city engineer: "Wichita has been carrying on a very intensive program of street and sewer construction during 1946 and with an increasing tempo during 1947.

"As of June 181,000 sq. yd. concrete paving was under contract, 107,000 sq. yd. authorized by approved petitions. Also 38,000 of asphaltic concrete pavement under contract and 33,000 sq. yd. more authorized. Work represents 157 proceedings, each a short block to a half mile in length. $1,750,000, including sewers.

"Among new equipment being employed is a 34-E paver. The asphalt pavement contractor also has a new Simplicity asphalt plant which is just going into operation. All of our contractors have been able to buy new forms, which are a great improvement in adding to the appearance of the finished work.

"The one shortage as yet is skilled men. The concrete paving equipment could be operated 16 hours a day if additional personnel were available. There just aren't any additional form setters or finishers or operators to keep the equipment going.

"Most paving is in new additions being promoted by speculative builders to satisfy the housing demand. The Building Inspection Department has been issuing permits at the rate of one million dollars per month for about 1½ years and most of it is for residential construction. Commercial construction is just now starting.

"Perhaps the reconstruction of old streets would be of more interest to your readers. We did about a mile of this type of work in the retail district last year. The bid price for 6-in. concrete was $2.35 per sq. yd. Asphaltic concrete pavement with a 2-in. asphaltic concrete surface and 5-in. concrete base was bid at $2.55. This is about a 40 percent increase over our prewar price. The largest increase is in the cost of the reinforcing steel which we use, and due to the fact that oil field sucker rods are no longer available and new steel must be used, the price has increased from about 4c to 8c per pound.

"There is also a public demand for some new bridges, widening of old ones, and also additional storm water sewer facilities. We have not scratched the surface on this yet."

Tucson, Ariz.—Glenton G. Sykes, city engineer, writes that his city sealcoated some 450,000 sq. yd. of asphaltic type pavement during the 1946-47 fiscal year. Some of this work includes a hot seal (SC-6) and 18 lb. per sq.yd. hot blotting sand, done mostly with city forces.

Under the Arizona special assessment act Tucson installed $480,000 in sewers and new street paving. Plans are under way for $700,000 more.

San Francisco—Street work for 1947, according to city engineer Ralph G. Wadsworth, will include about 1,000,000 sq. ft. of paving to cost $800,000 including property; two important highway interchanges, $815,000; bridges to cost $1,546,000 including a double-leaf bascule.

Columbus, Ohio—As of June 1, according to city engineer P. W. Maetzel Columbus had up for bids streets totaling 1½ miles and ½ mile of alleys. About 10 miles of streets will have car tracks removed, partly at traction company expense. Two new bituminous-paved thoroughfares are planned; also 6 to 8 miles of new streets in real estate developments. Also needed is resurfacing of 2 miles of old brick. Lack of engineering forces is a bottleneck.

Boise, Ida.—J. F. McBirney, city engineer: "We plan to surface-oil 54 blocks of old oiled streets, resurface 13 blocks old pavement."

Detroit—As of early June a $2,000,000 program of street work was programmed for lettings to be strung through the summer, according to Martin R. Fisher, ass't city engineer. This work, initiated by property owners for assessment, involves standard 8-6-8 concrete with integral curbs, averaging $3.50 per sq. yd. on recent bids not including drainage.

Cleveland—J. C. Wenrick, commissioner of engineering, reports: 2.55 miles of city streets will be paved by contract ($300,000); 9.13 miles of resurfacing planned by state and county, the city contributing to cost ($605,000); surface treatment by city forces with No. 6 slag and bitumin application will range from 200,000 to 800,000 sq. yd., depending on availability of slag material.

Saginaw, Mich.—Hugh A. Benner, director of public works, says that 26,000 sq. yd. of 5-in. concrete with combined c. and g. is planned along with 44,000 sq. yd. aspaltic concrete surfacing—equivalent to 4.1 miles of 26-ft. street.

Tulsa, Okla.—Some three million dollars in unspent bond proceeds is available for streets and boulevards and $1,000,000 will be used this year, according to Dan W. Patton, city engineer. Most projects will consist of widening to new widths varying from 40 to 60 ft. or complete construction of unimproved boulevards. Pavements are to be 9-7-9 concrete with integral curb; widenings are concrete, with asphaltic cover for old roadway portion.

About $750,000 in assessment pavement will be built, volume depending on ability of staff to prepare plans.

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Cleveland Safety Council Adopts 3-Step Street Lighting Program

Aimed to help city planning, the Greater Cleveland Safety Council street lighting subcommittee has outlined a three-step procedure preliminary to recommending street lighting improvements in Cleveland. First step will be classification of streets conforming to the light code of the Illuminating Engineering Society. Second step calls for a study of comparative light deficiencies on streets classified. Finally, a priority list of streets to be improved will be prepared. The list will be based on considerations of traffic volume, accident facts and crime incidence. When all the lighting data are assembled, the group will convey its recommendations to the City Council. Chairman of the group is Harold H. Gorman.

★ Victory in California

Nothing we can talk about is of more far reaching importance than the question of selling legislatures on needed highway programs.

The old way was to do it emotionally through personal contacts.

The new way is to compile c mplex highway planning survey data and other technical facts, analyze them to develop clear and overwhelming proof of the need, and present the information in a visualized form for ordinary mortals to see and understand.

This was done in California in recent months. With the help of specialists in public relations and public interpretation of such complex data, the California highway commission went before its legislature with a program that only Californians with their pioneering spirit would have dared. It called for doubling the 3 cent gas tax—although California already led all states in gas tax revenues—as the financing basis of a long-range program of urban expressways integrated with other highway, street and bridge developments.

The fight in the legislature this past spring was something to fill front page headlines, and it did. The bill almost died and with it the whole program, it seemed for a while. But on June 23 the governor who had fought for the program so staunchly signed Assembly Bill No. 46, raising the gasoline tax 1½ cents and thus activating a ten-year 18-billion-dollar revenue program which is outlined in some detail elsewhere in this issue of ROADS AND STREETS.

A lesson is vividly brought out in the California experience. It is that no legislature can hold out long against overwhelming facts, and that fact gathering and presentation must be elevated to a front rank position in the function of highway organizations. But dry statistics alone won't move legislators to set up or increase a road program. Visualization and dissemination by skilled specialists are necessary. The modern highway plant today is too complex in its economic effects.

But when the facts themselves are sufficiently compelling *and* are presented in understandable form, no legislature can side-step them for long.

California's state highway chief, G. T. McCoy, in discussing this point with us, observed: "What could have been done without such analysis and complex data? It might be said that final legislative action here was a political compromise. It must be admitted, however, that this final action actually represents a pretty well developed highway program for California. The elaborate analysis and complex data were *always* before the legislature and the individual legislators. They could not escape it, no matter which way they turned; we kept it before them at all times. Without such a presentation, we are convinced that insofar as California is concerned no program would have been developed by the legislature."

★ Get Rid of those Ancient Rigs

All over the country we see repairmen in state, county and municipal equipment shops laboring and swearing over old trucks and rigs that ought to have been sent to the Old Ladies' Home years ago.

Why all this labor of love over equipment that isn't worth the trouble, and in fact is penalizing efficiency and blighting department morale? Is it a lack of cost records, which if available would so clearly show the fallacy of keeping over-age or obsolescent equipment in service? Or lack of funds for new equipment? Or what? Any highway or municipal department that has funds for roadway maintenance and repair cannot afford not to put a proper amount of the available money into renewing its outfit, now that the war is long since over.

During the war years there was good reason to use brave methods and bailing wire to keep old units going. ROADS AND STREETS presented its share and more of case examples of emergency salvage methods. But the fact remains that the keep-'em-going-at-any-expense policy was indeed a costly one. Many an equipment user has spent as much for parts and labor on his old 5 to 10-year-old truck as two new trucks would have cost.

Too many old machines in a highway or street repair fleet is a sign that someone is ignorant, scared to go after the appropriation, or just doesn't give a damn.

★ Night Safety, an Engineer Task

At the President's traffic safety conference in Washington [reported July R and S], many subjects were discussed, and a report read outlining several policy steps that highway engineers can take to aid accident reduction.

We believe that one need wasn't properly emphasized. That is the *need for seeing better at night.* Every mother's son of you who reads this piece is a driver and will agree with us that almost every night you're out you face hazards due to lack of ability to see exactly what's what and where you are. Where is the pavement edge? . . . A rut or drop-off there? . . . Wowie! Another narrow culvert! . . . What does that indecipherable undersize, poorly spotted road sign say, anyway? . . . Where in the devil is the centerline, you wonder over and over in sudden desperation as you meet a guy who has failed to dim.

The same trends of thought enrich the pulse stream and keep you from finding life dull while tooling through the city on a rainy night.

An example of the night accident figures was given recently for Indiana by Wayne M. Timmons of Purdue University, who revealed that in his state 36% of all crashes and 54% of all fatalities resulting happen at night, in spite of the fact that only about one-third of the total motor travel occurs after dark.

Sure, we all go too fast at night. We must learn to slow down.

But, in cities we need better street lighting almost everywhere—and it'll pay big dividends.

We need better designed and regulated headlights. Enforcement agencies let lights go poorly adjusted. "No tail light," reads the typical news report of a fatal rear-end collision.

There's a need for more use of slab-edge stripes, for better shoulder maintenance.

Our engineering and administrative end of it, however, is the real challenge: *All roads ought to be designed for rainy nights.* If this were really done, we'd have signs three times as big in some places, twice as big and legible and visible everywhere else, and of course lots more reflectorizing and a generally speedier adoption of national committee recommendations on light, signals, signs and pavement marking.

★ Detours Again

Everywhere it's a good sign, in a way, having so many detours again. That means road-building is being stepped up, and the public must be sold constantly on the need for being patient and cooperative.

We recently rode over a detour highway, however, that called for more than patience. It was a ten-mile stretch of the most ruinous pot-holes and loose, dusty stone. Motorists came through grey with dust, their clothes ready for the cleaner. Several cars were seen along this stretch with flat tires—the penalty for hitting chuckholes. We stopped that evening and had our front tires taken off and examined for bruises that might cause blowouts later.

Strictly on the dollars and cents side, this road is costing the public far more than the price of a light oil treatment and the assignment of a patching crew and grader scarifier or two to the scene.

Most states have realized that detours are part of the economic scheme and paved, dust-treated or at least maintained detours on main highways are the order of the day.

This year, with road funds being depleted by high construction prices, the clamor for new roads is so great that some departments may be tempted to skimp on their detour maintenance. Hope we don't have to go near these guys again with our car.

★ Fewer Stop Signs

Washington, whose parent organization, the D. of C., won the National Safety Council's 1947 traffic safety award, has a severe critic in the city's *Evening Star*. In this instance we think the paper has "got something" (generally speaking at least), when it criticizes the over-doing of stop signs. An editorial notes that an unheeded stop sign is potentially as dangerous as an unguarded intersection. Washington has 75,000 traffic signs. A survey is quoted as showing that only three-fourths of motorists fully obey stop signs along arterials. Less than 45% come to a full stop along isolated corners—others slowing down or paying no attention. The city in 1946 recorded 305 accidents due to failure to obey signs. The editorial goes on to recommend a thorough overhauling of the metropolis' signs, with a view of eliminating or correcting outmoded, useless and conflicting signs.

This would be a good idea in many other cities, too.

And, may we timidly suggest that greater thought be given to the use of flasher-type red and amber signals where lighted signals are needed. They have the sight value of alternating stop-go signals, while allowing the motorist to proceed at once after stopping or pausing during low traffic hours. One of the things that irks the easily irked motorist is the necessity of waiting out a long stop period at off hours when there's not another car in sight. Reasonably or no, it's such little things which breed disobedience to signs generally.

★ Striping Neglect

We hear that after laboring long a joint committee has agreed on a standard system of marking pavement lanes and centerlines for state roads. The white dash lane at the center of two-lane pavements—with a solid line, either yellow or white, for "No Passing" areas—is part of a revised manual on Uniform Traffic Control Devices recently approved by sponsoring associations and submitted to state highway departments and other agencies for approval.

This is indeed a sensible solution, and one that will resolve the principal difference that has existed between the states, the color of guard stripe on No-Passing zones.

When and if a uniform pavement marking code is universally adopted, there will still be the very serious matter of seeing that all arterial pavements are kept freshly striped. In fifteen thousand miles of driving from coast to coast this summer your editor has wondered if some state highway departments haven't lost their paint pots.

Lack of paint may have held back some states, but if one state cannot get paint, how come others can? And how about more reflectorization? Many states are now using it.

Where a large mileage must be repainted, the job ought to be classed as a real emergency and ganged up on by several crews.

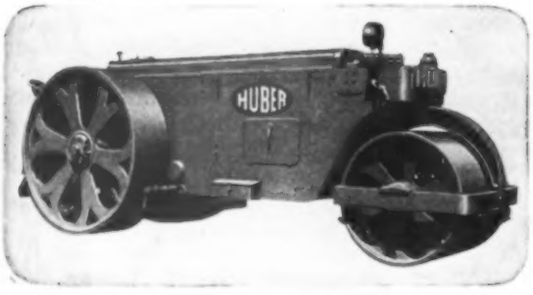
•

The day of senator-appointed road inspectors is supposed to be two decades gone. Yet claims that such practice has existed recently were aired in an Oklahoma newspaper. This item stated that "the highway department employs a corps of road inspectors . . . Many had little or no prior experience in highway construction, and were hired on recommendation of their senators. This practice has resulted in faulty construction and criticism, highway officials say."

This statement appeared as part of a report, issued by newly appointed director of highway H. E. Bailey (who stepped up from state highway engineer), stating that effective immediately division engineers would be made responsible for inspection of gravel base and asphaltic surface projects, to insure strict compliance with plans. We hope, Mr. Bailey, that trained inspectors are more plentiful down your way than in some other states.

EVERYWHERE YOU GO

HUBER MAINTAINER
A versatile machine that also serves as a bull-dozer, lift-loader, patch roller, snowplow, or rotary broom.



HUBER 3-WHEEL ROLLERS
Automotive type, built in sizes from 5 to 12 ton.

HUBER TANDEM ROLLERS
Variable weight, built in sizes from 3 to 12 ton.

HUBER
ROAD MACHINERY
is on the Job

It is a lot of satisfaction in knowing that promises and budgets for road building and maintenance can be made with full confidence that the road machinery you own will back you to the limit. Huber 3-Wheel Rollers, Huber Tandem Rollers, and the versatile Huber Maintainer is just that type of equipment. Many, many years of experience in building road machinery, plus a working knowledge of your problems have gone into Hubers to provide the speed, power, and dependable performance you need to do your best work. Your Huber Distributor will be glad to discuss these points with you.

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ROAD ROLLERS *and* MAINTAINERS

Air Entrainment Control

Test Project Completed in Chicago

Chicago Department of Streets uses air entraining agent at mixer with satisfactory results

By C. John Chambers

Engineer-Examiner, Finance Committee Staff, City of Chicago

THE advantages of air entrained concrete for scale prevention on street paving subject to de-icing chemicals have been proved conclusively on Chicago's streets. As with other street and highway departments, however, Chicago's department of streets and electricity has experienced difficulty in controlling the air content in the concrete. Since close control is highly desirable, Commissioner of Streets Lloyd M. Johnson decided to set up a test project, involving an air entraining agent added at the mixer. This project is described in detail herewith.

The testing and control on the project was conducted by the Bureau of Streets with the active and helpful cooperation of the Department of Highways, State of Illinois.

The concrete pavement placed consisted of one 10-ft. and one 19-ft. slab of 10-in. thickness adjacent to the south curb of W. Pershing Road between S. Damen Avenue and S. Western Avenue, a distance of one-half mile, state designation, project FA-98-0404.1 C. S. This is a Federal-aid route in the City of Chicago carrying heavy vehicular and truck traffic.

Placing of the test section was started Sept. 30, 1946, and continued through Oct. 10. The amount of concrete placed under test conditions was about 2300 cu. yd.

The materials used consisted of torpedo sand from Oswego, Ill., symbol GD, sp. gr. 2.69. Crushed limestone came from McCook, Ill., symbol EW, sp. gr. 2.66, with average voids of 41%. Two brands of normal portland cement were used. The paver was a 34-E Rex dual-drum unit with 37.4 cu. ft. capacity.

The basic mix provided for the following quantities per bag of cement:

Mortar	C.F.	2.51
Abs. vol. of C.A.	C.F.	2.01
Yield	C.F.	4.52
Fine aggregate	Lbs.	195.00
Coarse aggregate	Lbs.	333.50
Water	Gals.	5.15

The air entraining admixture used (Darex AEA) is described by the manufacturers as a triethanolamine salt of a sulphonated hydro-carbon. It is a water-soluble solution and is delivered ready to use in 55-gal. drums.

Air content determinations were obtained by using a slightly modified apparatus of the Klein-Walker type. In determining the percentage of entrained air, two sets of apparatus were used operating at different pressures. The data for air content recorded in Table 1, were determined with apparatus operated with 30 psi. pressure. On Sept. 30 and Oct. 1 a similar apparatus operating with a pressure of 8 psi. was used as a check against the 30-lb. tests. It is interesting to note that the results obtained checked within very close limits.

Specific gravity of the coarse aggregate and free moisture in fine and coarse aggregates was determined by apparatus and methods developed by the late Professor Dunagan.

Specifications of the Illinois division of highways provide for 3% to 5% entrained air. Some authorities specify 3% to 6%. Beams and cylinders made during the test with percentages more than 5% and not to exceed 6% showed no proportionate loss of strength when compared with beams and cores made with slightly less than 5% of entrained air.

Slump Control a Problem

Maintaining a constant slump has been a real problem in all our construction work. We were inclined to think that varying amounts of free moisture in the fine aggregate may have been a contributing factor. On Pershing Road the mixer was precalibrated and the water measuring mechanism checked and corrected to close accuracy. The hopper scales, for weighing cement and aggregates, were carefully checked and adjusted before starting operations. Two inspectors were assigned to the material yard so that sand, stone and cement scales were under constant surveillance. A proportioning engineer at the job made slump tests, air determinations and beam and cylinder specimens. The batch trucks were of adequate size and did not spill over in discharging into the skip. The skip of the mixer emptied completely each cycle. Frequent moisture determinations showed no wide variance in the moisture content of the aggregates. Our inability to maintain a relatively constant slump may have resulted from variations in water pressure in the city mains.

Batches at the yard were periodically sampled for moisture tests. The batches from which specimens were taken at the yard were identified and slump tests, air determinations, and strength specimens were made therefrom at the job. This procedure enabled us to make accurate determinations of water content, mix composition and physical properties of the concrete at frequent intervals.

Data obtained from this test section are recorded in Table. The results show that controlled air in concrete can be obtained by the addition of a satisfactory air entraining admixture to normal portland cement at the mixer. An average air content of 4.3% was obtained with a range of 2.3% to 6.0%. Apparently some variations in the sand, particularly particles passing the 100-mesh sieve, serve as air entrainment depressants. Compensation for these variations was accomplished by adjusting the amount of the agent added. In the case of Cement Brand B the air content ran slightly higher than with Cement Brand A. It was decided not to lower the amount of air entraining agent added, in order that the effect of higher air content on strength and other properties might be observed. Tests on Brand B air entraining cement during the 1946 construction season had shown the percentage of entrained air to be usually at the specification minimum of 3% and occasionally less.

Added by Hand

In making the test the agent was

"PERFORMANCE has been PERFECT"

Pioneer 20" x 36" Jaw Crusher Model 150 P.R.L.-2036 and Pioneer 22" x 40" Roll Crusher secondary unit Model 2405 powered by a 4-71 and a 6-71 GM Diesel engine respectively.

It takes a lot of power to crush 1000 tons of large rock a day and turn it into sand and gravel.

That's why the National Truck Service of Asheville, N. C., chose GM Diesels when they set up this rock-crushing plant. Tough GM Diesel power gives them production up to 170 tons per hour at a fuel cost of less than 10¢ per ton.

Because GM Diesels are 2-cycle engines, they provide power at every piston downstroke. They are built to "take it" on tough jobs such as this. They are cleanly designed and "easier to get at" should servicing become necessary. They are compact and easier to install.

All this makes the GM Diesel ideal for all kinds of construction work. If you have a tough, demanding construction job where dependable, low-cost power is a MUST—better get all the facts about these hard-working, husky GM Diesels.

DETROIT DIESEL ENGINE DIVISION

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GENERAL MOTORS

GM GENERAL MOTORS DIESEL POWER

DIESEL BRAWN WITHOUT THE BULK

added by hand, usually by pouring it on the batch in the skip. At other times the agent was added to the sand in the batch truck, a preferable method when adding by hand. The ideal method, of course, would have been to add air entraining agent to the mixing water by means of an automatic proportioning device. Time did not permit installation of this equipment. While making the initial mixes, various quantities of Darex were used to determine the ideal quantity as shown in Table 1. The results sought were quickly obtained. Subsequently, careful, accurate tests at frequent intervals were conducted to determine the amount of entrained air in the concrete.

Excellent workability and placeability of the concrete were obtained. The pavement surface closed well with finishing operations. There was a negligible amount of bleeding. Concrete with a slump of 2 in. or less placed easily and finished without tearing. The concrete mix bulking before the finishing machine appeared to be of stiffer consistency than actually shown by slump tests. What appeared to be 1½ to 2 in. slump concrete usually tested from 3 to 4 in. slump.

The practice of adding an air entraining agent at the mixer is considered to have a very important advantage over the use of an air entraining cement placed in batch trucks at the material yard. Where tests on the job of the concrete discharged from the mixer disclose more or less percentage of entrained air than is desirable, immediate corrections can be made at the mixer by changing the quantity of air entraining agent added.

Where air entraining cement is used, necessary corrections may be made by redesigning the mix and changing material weights at the source of supply. Such a procedure involves changes in the character of the concrete, changes which may or may not be desirable. Redesigning the mix and making the necessary corrections usually require considerable time during which concrete may be placed with air contents outside the specification limits since a number of batch trucks will be in transit while the adjustment is made.

If the mixer is equipped with an automatic measuring device for the admixture, no additional operations are required of the contractor in using the air entraining agent other than maintaining the supply of the material.

Concrete from four test batches to which no air entraining agent had been added was placed on the subgrade and completely covered with air entraining concrete. Air entrainment tests of the batches containing

(*Continued on page* 112)

Date 1946	Time	Station	Temp. Of.	Brand of Cement	*Fl. Oz. Darex Mix	**W/C	Slump in Inches	% Air	Wt. Cu. Ft.	Modulus of Rupture 7 Day	Modulus of Rupture 14 Day	Compression 7 Day	Compression 14 Day
9/30	8:30AM		50	A	11	.44	4.5	3.8	....	...	...	....	....
9/30	10:10AM		51	A	15	.42	1.0	4.7	146.6	685	850	3950	4880
9/30	11:10AM	21/00(10')	55	A	15	.43	2.0	4.2	147.0	615	865	3340	5050
9/30	2:25PM		55	A	15	.44	1.0	2.3	149.0	Test		....	....
9/30	2:25PM		55	A	15	.44	..	3.0	....	Repeated		....	....
10/1	8:45AM		50	A	16	.43	3.5	5.6	145.8	...	...	....	....
10/1	9:45AM		57	A	16	.38	3.0	6.0	147.2	...	...	....	....
10/1	10:10AM		58	A	14	.40	4.3	5.4	....	...	...	....	....
10/1	10:40AM		59	A	14	.41	1.5	4.0	....	...	...	....	....
10/1	11:05AM		60	A	14	.41	4.5	3.2	....	...	...	....	....
10/1	11:25AM	6/82(10')	61	A	14	.43	7.5	3.6	....	710	820	3160	3860
10/1	12:10AM	5/58(10')	62	A	14	.42	2.0	4.0	....	715	840	....	....
10/1	12:55PM	5/48(10')	62	A	14	.42	3.0	4.8	....	...	...	....	....
10/1	1:30PM	3/90(10')	63	A	14	.42	3.5	3.5	....	...	...	....	....
10/3	8:30AM	27/95(19')	67	A	14	.42	..	3.6	....	...	...	....	....
10/3	9:30AM	27/2 (19')	68	A	14	.42	3.5	4.1	....	...	...	....	....
10/3	10:00AM	26/25(19')	68	A	14	.43	3.0	3.8	....	...	...	....	....
10/3	10:30AM	25/95(19')	70	A	15	.43	6.0	3.2	....	...	...	....	....
10/3	10:45AM		70	A	..	.43	5.8	..	....	...	...	....	....
10/3	11:45AM	25/00(19')	73	A	16	.42	2.0	4.6	....	640	740	....	4650
10/3	1:15PM	23/88(19')	79	A	0	.42	7.0	0.0	....	655	755	....	....
10/3	1:45PM	23/40(19')	79	A	16	.42	4.5	4.6	....	...	...	....	....
10/3	2:00PM		79	A	16	.43	1.5	..	....	...	...	....	....
10/3	2:30PM	22/70(19')	80	A	16	.44	4.0	3.3	149.2	...	...	....	....
10/3	2:40PM		80	A	16	.40	4.0	..	....	...	...	....	....
10/3	3:00PM	22/05(19')	80	A	16	.38	3.0	..	....	...	...	....	....
10/7	8:30AM	21/00(19')	66	A	16	.43	3.5	..	....	...	...	....	....
10/7	9:10AM	20/35(19')	66	A	16	.43	4.0	..	....	...	...	....	....
10/7	9:35AM	19/80(19')	67	A	16	.45	3.5	3.9	146.2	625	745	2800***	....
10/7	9:50AM	19/60(19')	68	A	14	.45	4.5	3.0	148.8	...	...	2850***	....
10/7	10:40AM	18/45(19')	69	A	16	.43	1.5	4.0	147.6	...	...	....	....
10/7	11:50AM	17/15(19')	76	A	0	.43	1.0	0.5	152.8	...	...	....	....
10/7	1:20PM	15/55(19')	76	A	16	.43	3.0	3.3	....	...	...	....	....
10/7	3:40PM	14/55(19')	74	A	*16	.43	3.0	4.2	....	...	...	....	....
10/7	3:50PM	14/42(19')	74	A	*16	.43	3.5	4.4	....	...	...	....	....
Average			..	..	15	.424	3.4	4.0	147.5	660	783	3250	4610
10/8	9:55AM	11/30(19')	68	B	16	.38	6.0	5.5	....	670	820	3640	4225
10/8	10:20AM	10/70(19')	70	B	16	.38	6.0	4.3	....	665	805	3550	4445
10/8	10:45AM	10/25(19')	71	B	16	.37	4.5	5.4	....	...	...	....	....
10/8	11:10AM	9/50(19')	73	B	0	.37	2.3	1.8	....	...	...	....	....
10/8	11:30AM	9/10(19')	74	B	0	.37	2.8	0.9	....	...	...	....	....
10/8	11:45AM	9/05(19')	75	B	16	.37	3.0	5.0	....	...	...	....	....
10/8	2:00PM	6/08(19')	79	B	*16	.38	1.0	5.1	....	...	...	....	....
10/8	3:00PM	4/25(19')	80	B	*16	.40	4.0	5.9	....	...	...	....	....
10/8	3:30PM	4/35(19')	80	B	*16	.40	2.0	5.3	....	...	...	....	....
Average			..	..	..	.38	3.5	5.2	....	...	...	3595	4335
10/10	8:30AM	5/30(19')	62	A	16	.43	3.0	..	....	...	...	....	....
		5/75(19')	..	..	..								
10/10	10:05AM	6/50(19')	70	A	16	‡.42	2.8	4.5	....	...	...	....	....
	40 W.W.C.B.L. Western Blvd. S.S.		76	A	16	‡.35	5.0	3.4	....	...	...	....	4180
10/10	12:20PM 65' W.W.C.B.L.S.S. Western Blvd.		77	A	16	‡.36	3.0	4.5	....	...	...	....	....
10/10	12:40PM 35'EE SS 78 Western Ave.		78	A	16	‡.36	2.5	..	....	...	...	....	....
	Average		..	..	16	..	3.3	4.1	....	...	...	....	4180
	Grand average		..	..	15.3	.42	3.4	4.3	....	...	...	3300	4517

*Darex added to sand in batch truck—all other mixes Darex added to batch in skip.
**Cement content, 6 sacks per cubic yard. (Theoretical yield is 27.12 C.F.).
***Specimens were honeycombed, probably due to failure to rod.
‡Special mix.

Build the strength of steel into every concrete slab with Welded Wire Fabric

CONCRETE PAVING SLABS—on airport runways, super-highways and city streets—must be fortified against heavy loads, vibration, stresses and strains in all directions, if they are to give long, satisfactory service, at low maintenance cost.

That is why so many construction engineers are building the strength of steel into concrete paving slabs with Welded Wire Fabric reinforcement.

Closely spaced electrically welded cold drawn steel wires distribute strength evenly throughout concrete paving slabs. So you can use larger slabs, with fewer transverse joints. When cracks occur, they are held tightly closed, preventing further damage to the slab.

Paving slabs with welded wire reinforcement also yield to subgrade changes without damage. In short, welded wire reinforcement provides dependable crack control. And remember, when you reduce the rate of cracking, you increase the life of the concrete paving slab.

You use less steel, less concrete, when you use Welded Wire Fabric reinforcement. Delivered ready to lay, in flat sheets, it is easily and quickly handled, lies flat and stays put.

On every concrete construction job there are places where the most practical and economical reinforcement is Welded Wire Fabric.

WELDED WIRE FABRIC

WIRE REINFORCEMENT INSTITUTE, INC.

NATIONAL PRESS BUILDING
WASHINGTON 4, D. C.

★ Contractor's "Materials grade separation" as seen this summer up on the Ridge by Los Angeles-to-Bakers field travellers

700,000 C.Y. Roadway Excavation

Belted Across Busy Arterial

Clyde Wood, Inc., built special 600-ton-per-hour belt conveyor as basis for bid on California U.S. 99 involving unusual problem of earth handling under traffic.

ANYONE who has speeded along the Ride Route north of Los Angeles into the Central Valley can visualize how heavy a traffic stream this section of U.S. 99 carries. It is high-speed traffic, too. When a 2.6-mile steep, winding section of 3-lane roadway from Colomos Creek to Violin Saddle was scheduled for relocation and widening to 4 lanes, the problem of maintaining traffic during construction became a major factor in the contractor's strategy. For it so happened that most of the 700,000 cu. yd. of excavation involved would have to be carried across the existing roadway, 100,000 cu. yd. alone coming from the large hill pictured here.

In inviting bids the California department of public works asked contractors to propose any feasible scheme of getting this yardage quickly across and still maintaining traffic. A temporary overpass was one possibility, as was the employment of flagmen with some system of alternating highway traffic with scraper traffic. Detouring here was out of the question.

The low bidder, Clyde W. Wood Co., of North Hollywood, based its bid on the use of a belt conveyor, pictured herewith as it was subsequently designed and built in the contractor's shop. The assembled equipment includes (1) a 66-ft., 40-in.-wide endless belt, supported on wheel-mounted

★ (Group of scenes) Moving a mountain for sure! Some of the details of the conveyor made largely in Clyde Wood's shop. Glimpsed also is a panorama of the old road, showing large high-leven push-down borrow area being worked by dozer. The wheel mounted conveyor can be moved easily to different points as needed

steel frames spaced 40 ft. apart on the existing roadway shoulders; and (2) a supply belt at 90 degree with the overhead belt, fed from a (3) hopper with mechanical feeder, via (4) a 2½-yd. Koehring diesel shovel. The outfit is said to have cost $30,000.

Material for belting is dug directly from the adjacent hillside by the shovel, or brought up to shovel reach by scrapers when necessary. On the other side, material drops into trucks, tractor pans or self-powered earth-movers, depending on the haul and disposition.

All parts of the conveyor outfit excepting the rollers, pulley and belt were fabricated by the contractor or made from parts of discarded machinery. The mechanical feed belt, for example, consists of a steel crawler unit off an old Athey wagon. Belts are operated via enclosed gear boxes or belts, powered by individual electric motors from an 85 kw. diesel generator set.

The conveyor is easily moved to new positions along the row. Each element of the outfit is so designed that it can be knocked down and hauled or towed on its own rubber tired castor-style wheel mountings.

The completion date for the $763,000 project is March, 1948. Photos shown here were taken by staff personnel of the California division of highways, Los Angeles district.

All Eyes on California!

Presenting features of the Collier-Burns Act of 1947, which provides $175,000,000 annually in highway revenues . . . inaugurates important administrative changes . . . puts California far in front as our No. 1 state in assured funds for highway development

CALIFORNIANS reached for the moon in recent months, seeking legislative OK on a super-colossal highway program that took in intercity expressways and an integrated program of motor transportation facilities without precedent.

A joint legislative fact-finding committee headed by Randolph Collier dug perhaps more deeply into complex road, street and bridge needs than was ever done before on a state-wide scale. Under the direction of G. Donald Kennedy on loan from the Automotive Safety Foundation and other experts, facts were analyzed, visualized and presented in a manner of dramatization and with a degree of thoroughness which represented a new "far North" in such effort.

The program sought independence for the highway commission to spend funds on a basis of traffic need rather than population-area basis. Doubling of the gasoline tax—from 3 to 6 cents—was proposed.

Strong organized opposition from oil companies and road user groups threatened for a time to stymie the whole program. But in June, Governor Warren signed a compromise bill, the Collier-Burns Act.

Following are highlights, gleaned

Estimated Revenue and its Distribution Under the Collier-Burns Highway Act of 1947.
Showing Comparison with Revenues Under Old Law.

	Fiscal Year 1948 - 49 1/			Ten-Year Period - July 1, 1947 - June 30, 1957.		
	Total Revenue	Revenue Increase Under Act	Revenue Under Old Law	Total Revenue	Revenue Increase Under Act	Revenue Under Old Law
Source of Revenue:						
Gasoline Tax	$118,968,000	$39,656,000	$ 79,312,000	$1,251,855,000	$404,955,000	$ 846,900,000
Diesel Tax	3,679,000	1,226,000	2,453,000	38,715,000	12,525,000	26,190,000
Registration Fees	24,490,000	12,245,000	12,245,000	265,382,000	126,917,000	138,465,000
Weight Fees	16,041,000	8,454,000	7,587,000	171,517,000	86,629,000	84,888,000
Gross Receipts Tax 2/	6,224,000	6,224,000	---	67,772,000	67,772,000	---
Operators' and Chauffeurs' fees	2,500,000	2,350,000	150,000	26,406,000	24,906,000	1,500,000
Miscellaneous Fees	2,761,000	---	2,761,000	30,755,000	---	30,755,000
Total	$174,663,000	$70,155,000	$104,508,000	$1,852,402,000	$723,704,000	$1,128,698,000
Distribution of Revenue:						
Dept. of Motor Vehicles & Highway Patrol	$ 14,046,000	$ 3,896,000	$ 10,150,000	$ 162,611,000	$ 48,832,000	$ 113,779,000
Counties	42,195,000	9,914,000	32,281,000	451,491,000	101,239,000	350,252,000
Cities	16,523,000	9,914,000	6,609,000	171,814,000	101,239,000	70,575,000
State	101,899,000	46,431,000	55,468,000	1,066,486,000	472,394,000	594,092,000
Total	$174,663,000	$70,155,000	$104,508,000	$1,852,402,000	$723,704,000	$1,128,698,000

1/ 1948 - 49 is the first fiscal year in which the increased tax rates are fully reflected in receipts and apportionments.

2/ After credit of 1/3 of weight fees. The credit is estimated as $2,270,000 for 1948-49 and $23,261,000 for the ten year period. The actual increase in truck tax payments (weight fees and gross receipts taxes) is $6,184,000 for 1948-49 and $63,368,000 for the ten-year period. This is computed by deducting the credits allowed against the increase in weight fees. Under previous law the gross receipts tax went into the State's general fund.

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You'll find Worthington Accessories as worthy of the Blue Brute name as the Rock Drills, Air Tools, Compressors and other "big shots" in this famous line. Air Hose, Paving Breaker Moil Points and Chisel Bits — Rock Drill Steel and Bits — Line Oilers, Valves, Couplings, etc. — all made to Blue Brute standards and thoroughly tested for the job to be done.

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WORTHINGTON

Worthington Pump and Machinery Corporation, Worthington-Ransome Construction Equipment Division, Holyoke, Mass.

IF IT'S A CONSTRUCTION JOB, IT'S A BLUE BRUTE JOB

from a financial analysis of the bill prepared for the committee by Richard M. Zettel.

Systems Set Up

Each county is to establish a primary system comprising not over 50% of total county-maintained mileage, and consolidate road administration under one commissioner. Counties must prepare road budgets in detail and report detailed road revenues and expenditures to the state controller in a prescribed manner.

Each city must select a system of Major City Streets, subject to approval of the state department of public works, but without percentage limitation; also to report detailed street revenues and expenditures to the state.

The controversial intercity expressway system was eliminated, but 46 miles of streets in Los Angeles area and 21.4 miles in the San Francisco Bay area were added to the state highway system. Specific minimum funds are earmarked.

The state will maintain state routes thorough cities.

The department of public works must henceforth submit an annual budget to the legislature, showing detailed revenues and expenditures anticipated, and must explain changes from previous year's budget.

Cost of utility changes involved on expressways, (all or certain portions) is to come out of D. of P. W. funds. In certain cases the utility has up to 10 years to pay.

$175,000,000 First Year

The above sum is anticipated for 1948-49, first full fiscal year, or $70,000,000 more than currently being raised. $1,852,000,000 in highway user taxes is anticipated over 10 years, $724,000,000 attributable to the new tax increases.

Gas tax is now 6c instead of 3c; expected yield for 1948-49 $119,000,000, up nearly forty million. Diesel fuel tax is 4½c instead of 3c; registration fee $6 instead of $3. Operator and chauffeur license fees of $2 for a 4-year term are imposed.

Truck Taxes Upped

A new system of taxation for commercial vehicles is a major feature. Unloaded weight fees are substantially changed, being raised various percentages depending on weight bracket and classification averaging 102% increase for private trucks but only 13% for for-hire carriers. For-hire fleet owners actually will pay only about 5% more than before in a typi-

cal case analyzed. The 3% gross receipts tax, mainly on intercity for-hire carriers, goes to the road user fund now instead of the general state fund, but owners get some credit for weight fees. Private truckers who formerly have paid only 28.5% of all truck taxes, now will pay 42%. Truck and bus owners will pay about $22,000,000 the first full year, as against $16,000,000 at present.

New Fund Created

The act created a Highway Users Tax Fund. Net proceeds of gas and diesel taxes and transportation licenses go to this fund after refunds and administrative costs. Registration, weight, operators' and chauffuers' fees, etc., will go as before to the Motor Vehicle Fund, but any surplus after supporting the Motor Vehicle Department and the Highway Patrol will go to the Users fund.

Under the new act the counties will receive $5,400,000, allocated on a registration basis, and counties will continue to get 1 cent of the gas tax. The latter tax is divided among counties according to registration after giving each county $20,000 for engineering and administration and another $30,000 flat distribution per county.

Counties will also get proceeds of ⅜ cent of gas tax, distributed so that each county will get up to $300 per maintained mile of road per year, including the previously mentioned items. Half the balance of the ⅜ cent is divided on a registration basis and the remaining half-cent goes to counties otherwise not getting $600 per mile total from all other sources excepting the $20,000 grant.

Cities are to receive an equivalent of ⅜c gas tax for streets, in addition to present ¼c divided on a population basis. Three-fifths of each city's share must go for construction on major street system, the remainder for maintaining major or secondary streets. No money is earmarked for state routes through cities, which will be built and maintained by the state.

Cities all in all will get about 2½ times as much as formerly for major streets.

State Fund Disposition

Previously the state has been required to spend road funds under a formula dividing 48%-52% between northern and southern counties.

Under the new act, funds available after city and county distribution will go 45% to the 45 northern counties and 55% to the 13 southern with reservations as follows: Minimum construction expenditure guarantees are set

(*Continued on page* 113)

AIR PLUS JAEGER COMPRESSOR

get air costs down to today's Jaeger figures

Your Jaeger distributor is today supply headquarters for contractors in your locality who are applying modern *low-cost* air power to their work. He handles the finest air tools, engines and compressors on the market — he knows air — he is an important link in a chain of 128 Jaeger air stations across the U. S. and Canada which give on-the-spot service to contractors wherever their jobs may be.

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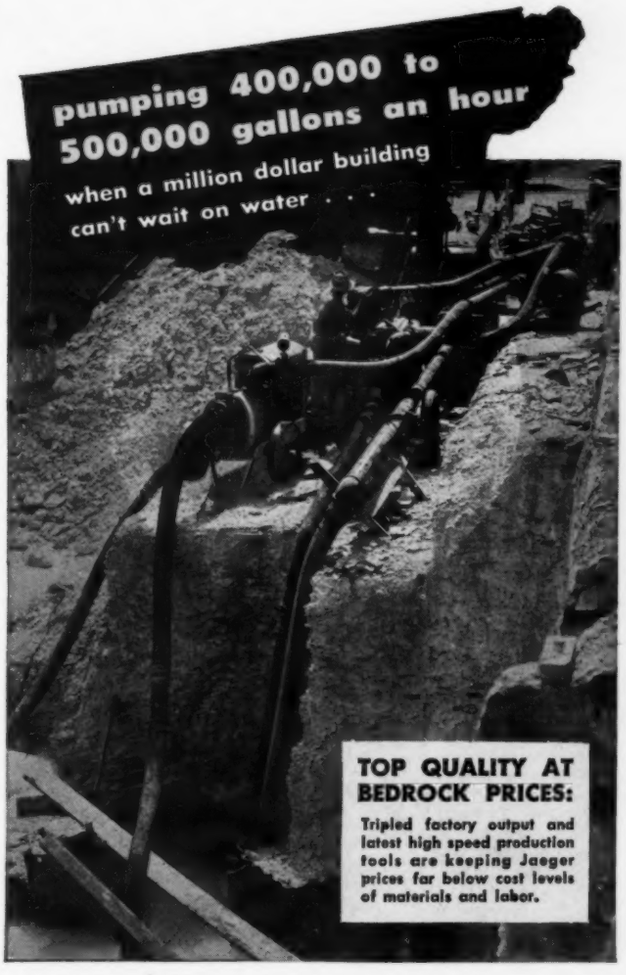
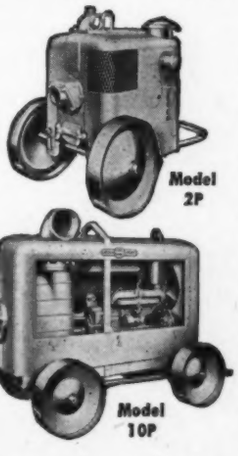
75% to 100% larger "Tough Swedish Twin" valves, ultra-lapped to leakproof closure — 20% to 30% slower, cooler piston speed — 100% efficient intercooling — force feed lubrication — balanced, precision parts — mean smoother, vibrationless performance, free air flow without the usual heat, carbon and power-wasting back pressure — more air from every pound and dollar of fuel and much lower upkeep with compressor units that outlast their original engines* 3-to1.

*Caterpillar, Continental, International power.

Ask us for the name of your nearest air station and copy of Catalog JC-5, the up-to-date buyer's guide for portable compressors of 60 to 600 ft. size.



Battery of 4 Jaegers worked 24 hours a day to dewater elevator pit excavation 12 ft. below low water table, at rate of 400,000 to 500,000 g.p.h.—one of many Jaeger pumping jobs on Burdine's new $1,000,000 store at Miami, Fla.



Your Jaeger distributor is the leading pump dealer in your locality. He keeps a big stock of pumps and fittings ready — for sale or rent. And they are Jaeger "Sure Primes," built and powered beyond their guaranteed performance, individually tested and certified, doubly sure and faster to prime, and fully enclosed from dirt and weather to keep both pump and engine operating at top efficiency for years of extra-satisfactory service. Sizes 1½" to 10". Ask for complete Catalog P-45.

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"I think that 'Caterpillar' Diesel Tractors and Engines are the best on the market."

"These engines are simple—most anyone can operate them."

"The main thing that I like about 'Caterpillar' Diesels is their ability to stay in there and work."

"Our 'Caterpillar' Diesels are rarely down for repairs."

The words are contractor W. R. Skousen's, but they're the kind of expressions you hear from satisfied owners of "Caterpillar" products the world over. They reflect a "Caterpillar" leadership in the field of Diesel-powered equipment that is becoming more and more pronounced as the years roll up unusual performance records by these sturdy, dependable, long-lived machines.

No wonder there's a big demand for virtually every type of "Caterpillar" unit—despite the fact that "Caterpillar" peacetime production is greater than ever. (A huge "Caterpillar" plant-expansion program is being pushed to completion.)

CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS

Quotations

ROCK CRUSHING, MODERN STYLE—Three "Caterpillar" Diesel Engines power this portable plant producing 175 tons of 1" rock per hour on a 60,000-ton job. A 'dozer-equipped "Caterpillar" D8 Tractor levels the material on an Arizona road which is being paved by a new reclamation service method. Owner W. R. Skousen is a long-time "Caterpillar" enthusiast.

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A SMALL ROLLER WITH A LARGE APPLICATION

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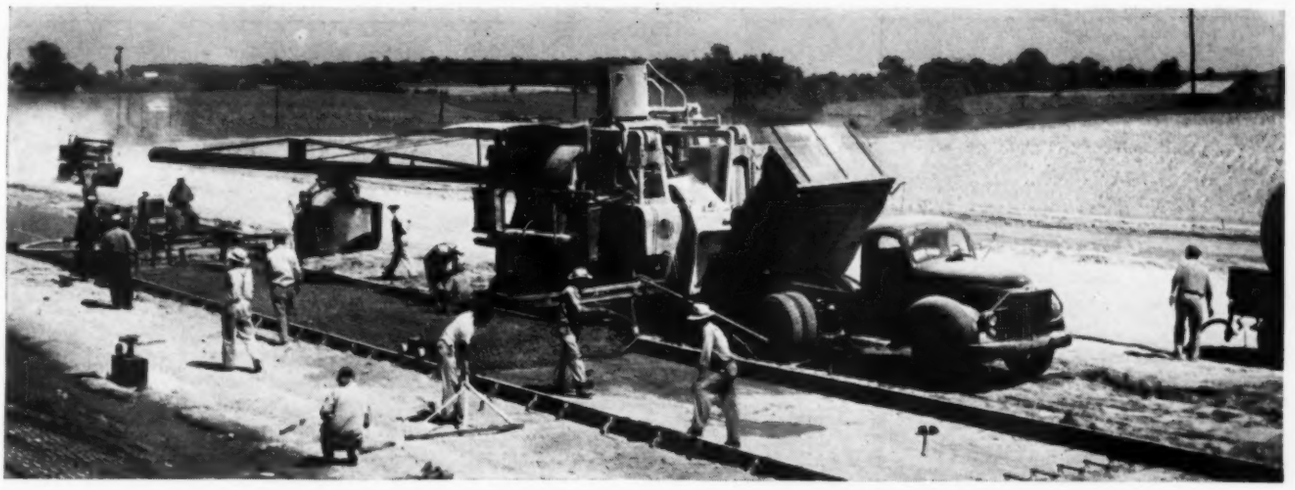
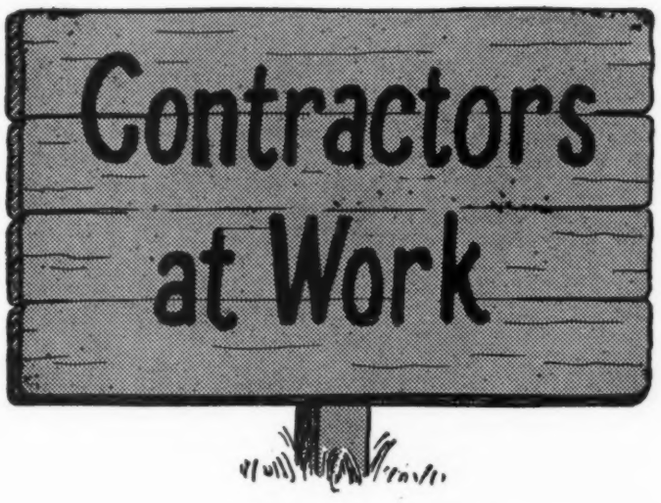


★ Smalley's Koehring 34-E dual-drum paver, just getting into its stride on the Ohio or 12-ft.-pour side of the job



D. R. Smalley & Sons
U.S. 40, Indiana-Ohio

★ (Left): Meet some of the family! D. R. Smalley, head of firm with son John. (Right) Mark Korb, res. engr. (Ohio hy. dept.); B. F. Brackman, head inspector; Francis S., Ed and Mark Smalley; and Jake Pundt, inspector. Not shown, George W. Jackson, res. engr. (Indiana) and staff, and sons Geo. M. Smalley, firm supt., and Luke M. Smalley, foreman

THIS road contractor has been busy since July, 1946, on two adjoining sections of reconstruction on U.S. No. 40. Totaling 3.26 miles, the combined $770,000 job is of special interest, in that part of it is on the Indiana side and part on the Ohio side of the state line. As part of a modernization program that will bring the National Pike up to inter-state standards, the new roadway double-tracks this portion of U.S. 40. The new work will embody 24-ft. concrete pavement on granular base, with broad shoulders, and turns and grades all but completely eliminated—see photo for "old" and "new" comparison.

Standards of the two states are quite similar, but the state-line location brings minor differences into the spotlight. One, the use of 9-7-7-9 concrete in Indiana and 9-in. uniform in Ohio, is merely a commentary on the rugged individualism that still exists among highway departments.

★ Two 1200-gal. water wagons took turns feeding the paver. Both tanks are designed for easy removal, making the trucks speedily available for other uses

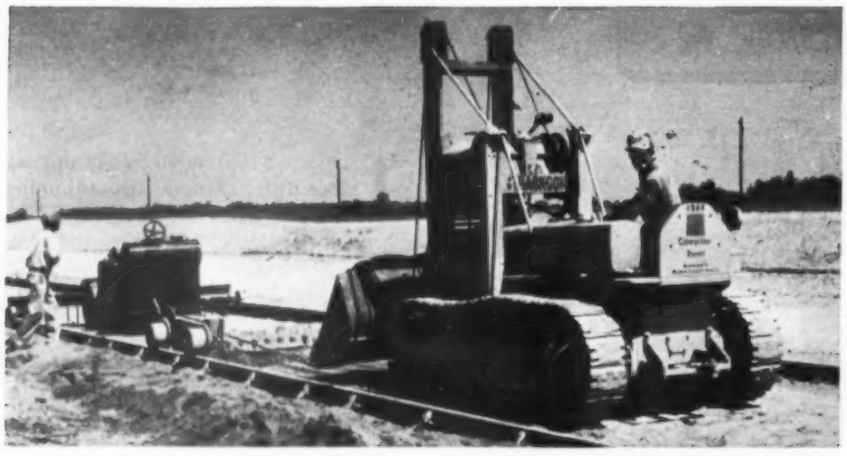
★ Blaw-Knox bins with automatic weigh-batching and a Lima crane took care of both the Indiana and the Ohio side of the job. Light, mobile 2-batch trucks were favored by D. R. Smalley & Sons, this truck being a Ford

More on next page

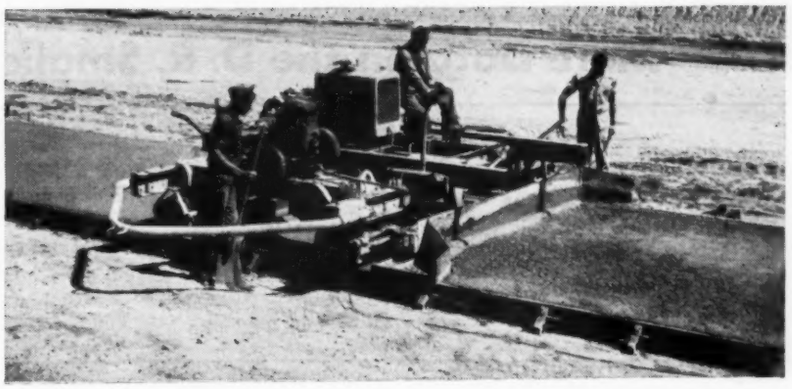
★ Fine-grade on the Ohio side was given final strike-off by this heavy screed, towed with a handy Traxcavator loader

Another—the requirement of construction in two 12-ft. pouring lanes in Ohio, as compared with a single 24-ft. job in Indiana—hit the contractor where he lives by requiring two complete sets of equipment in front and back of the paver. Most of the photos shown herewith were taken by the ROADS AND STREETS editors the first day of active concreting on the Ohio side. See photo captions for the details.

Smalley has had good weather breaks and bad. Last year he slammed out over 200,000 c.y. of grading with weather generally in his favor. This spring he was hung up through the wettest April and May in years (46 days rain). Such is life in the contracting business.



★ (Left): Final smoothing of granular base, with a small Kelly-Springfield roller. Scratch template used to check for accuracy (Center): Dowels for expansion joints. Note center longitudinal joint is to be keyed and tied. (Right): Cleaning up on the Indiana side. After loosing pins with a hand-operated puller, self-aligning Blaw-Knox form sections were yanked loose by means of a Bucyrus-Erie 22-B crawler-crane, using a specially devised lifting hook as shown [See May, '47 R & S, p. 66, for a similar lifting device, used by Basich Bros. in Calif.—*Editor*]



★ One of the newest Blaw-Knox oscillating screed spreaders getting a work-out. Note mobile generator unit setting on spreader, for operating vibrators

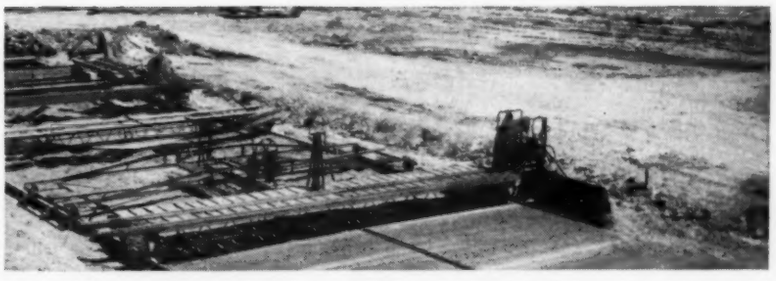
★ Concrete being vibrated along either form—Master Electric equipment with hand-held electric-motor-operated vibrator units powered from generator on spreader

★ Conducting standard Ohio test for air-entrainment, which modified hook gage test

★ Sorry we didn't get this critter unwrapped. It's a dandy—on the yoke of this trailer is mounted a small winch-operated crane, powered by a 4-cyl. gasoline motor. While having many labor-saving uses, it was built primarily for picking up and transporting pavement form with minimum labor

★ Finishing 24 ft. in one pour was OK until the contractor hit the Ohio line. His expensive modern outfit is shown here at the end of its run, left a-settin' while the crew got going on the Ohio side with equipment shown in other photos. Note automatic power spray unit for applying Truscon curing compound

★ A study in contrast—showing the old U.S. 40 2-lane highway, which is quite a good stretch of road as arterial roads go, alongside the new 24-ft. concrete slab which will convert this section into a 4-lane divided highway ultimately to meet all inter-regional design standards. Center strip to be 48 ft. wide



Continuing D. R. Smalley & Sons Job

More Data on the D. R. Smalley & Sons Job

A Few Typical Bid Quantities

Selected unit prices on D. R. Smalley & Sons projects pictured on adjoining pages. Both states awarded contract July 23, '46.

Indiana's 1.8 miles of partial relocation and 4-laning of 2-lane road with 48-ft. center mall involved $147,000 for grading and roadway, $133,000 for 24-ft. concrete paving and $17,400 for small structures; total contract, $308,454.

Ohio's 1.46 miles of similar construction cost $520,000 including an $85,000 bridge.

Notable item not fully itemized is extensive pipe footage for culverts and drain, totaling nearly 30,000 lin. ft.

Items	Quantity	Prices Unit
Indiana		
Excavation (common)	278,920 c. y.	.39
Overhaul	65,094 c. y.	.06
Added haul	9,498 units	.10
Pavement removal	11,228 sq. y.	.50
Fin. ditches and shoulders	19,471 l. ft.	.25
48" R.C. or C.I. culverts	712 l. ft.	10.50
6" perf. C.M. or V.C. drains	8,504 l. ft.	1.00
Rein. conc. pave. (9-7-7-9)	54,844 c. y.	2.58
Rein. steel for pave.	2,482 lb.	.08
6" traffic lane stripe (black)	3.766 mi.	350.00
Special borrow-grade "B"	7,313 c. y.	1.75
Grade "C" borrow, subgrade	11,422 c. y.	1.75
Exp. jt.—1" cork, rubber or fibre	277 l. ft.	0.60
Exp. jt.—1" perform., ld. transfer	327 l. ft.	0.70
Contraction joints	11,921 l. ft.	0.50
Bit. stabilized mixture—"A"	1,080 t.	10.00
Compacted aggregate surface	1,338 t.	3.50
Seed and fertilizer	2.82 acres	80.00
Plain seeding	2.82 acres	80.00
Mulched seeding	77.328 sq. y.	.07
Sodding	9,765 sq. y.	.30
Sodded shoulders	23,058 sq. y.	.30
Flexible steel guard rail	1,289 l. ft.	2.50
Paved side pitch—type "A"	6,545 l. ft.	1.50
Cone curb-type "B"	4,748 l. ft.	1.50
Maintaining traffic (lump)	.....	3,000.00
Wet. exca. (bridge)	1,229 c. y.	6.00
Concrete—class "D"	372.1 c. y.	40.00
Concrete—footings, "E"	676.0 c. y.	35.00
Concrete above footing, "E"	269.0 c. y.	35.00
R/f steel	72.67 u.	.08
Timber piles furnished	13,880 l. ft.	.60
Timber piles driven	11,104 l. ft.	.50
Furnish pile equipment	.....	200.00
Ohio		
Roadway exca.—unclass.	128,604 c. y.	.43
Remove, dispose old conc. pave.	8,787 sq. y.	.50
Sealing exist. cone. pave. edge	1,668 l. ft.	.10
Std. No. 1 manholes	2	150.00
Std. 1A or 2-A catch basins	4	25.00
Steel beam gd. rail, without brackets	2.986 l. ft.	1.50
Seed and protect rdway	137,362 sq. y.	.06
Commercial fertilizer (10-6-4)	26.868 lb.	.04
Classified embankment mat.	20.580 c. y.	1.85
Agg. ground limestone	134,340 lb.	.015
Sodding	11.902 sq. y.	.45
Japanese honeysuckle plants	2,246	.60
1" insulation-under pave.	416 sq. y.	.30
Asph. conc. leveling	538 sq. y.	16.00
Drying, pulverizing, scarifying, mixing, shaping, compacting	6,135 sq. y.	.50
Bit. surf. tr.	2,501 gal.	.30
9" r/c p. c. pave.	34,840	3.18

Run-Down Lined with Soil-Cement

Soil-cement doesn't have to be on a roadway. Here is an example of the effective use of a soil-cement mixture for paving a roadside gutter. This photo was snapped in East Texas, near Tyler, where the highway department decided to mix 10% portland cement with the sandy soil of the site to experiment a bit. The mixing was done in a small portable cement mixer, and the damp (not wet) mixed material was screeded and troweled into a rough gutter section and given a curing cover in the best tradition of soil-cement making. Thickness about 4 inches. Cost, about 30 cents a square foot.

When we stopped by to look at this improvement it had served two years. Several fine cracks had developed, due to shrinkage or uneven settlement. The ditch centerline had eroded a bit, the 7 to 10% ditch grade having had to carry sand-laden water. Otherwise doing fine and seemingly a good solution for the problem here.

Mail Inserted Card or Inquiry Blank (page 117) for Equipment Data

Again this issue of Roads and Streets carries descriptions of many new labor-saving efficiency devices and latest material developments. See our New Equipment and Materials Section beginning on page 104, for which a numbered reply card has been inserted to help you request data on items that interest you. Also on page 117 is an inquiry blank and advertisers' index which will help you get data on equipment and materials you need.

Lime Stabilization

and Low Cost Road Construction

Experience in Texas, notably in District 14 around Austin, shows success and economy of lime admixture which makes possible the use of otherwise unsatisfactory local soils

I—Experience in the Austin District

By W. D. Dockery
District Engineer, Texas Highway Department, Austin

OUR highway district, comprising ten central Texas counties, is in the common predicament of having to build and maintain a large mileage of relatively lightly traveled roads without sufficient satisfactory local base materials.

Most of the 1,306 miles of designated roads in the district have been surfaced, there being about 1,000 miles of flexible base roads with asphalt top and a small mileage of concrete. Only a few miles of new arterial construction are set up for the first three postwar years, our program consisting mainly of reconstruction of old highways and construction of new farm-to-market designations.

A large part of the 1,000 miles consists of a bituminous penetration topping placed directly on selected material. This low cost design was adopted as the initial step in stage construction. Stage construction has been an adopted policy in the district since its inception, not only because it was necessary to keep expenditures within available funds, but because it was believed to be the best method of obtaining stable pavement on the poor subgrade existent in the district. Due to the increase of traffic and loads since many of the roads were constructed, corrective measures have become a necessity. Some of the existing roads are breaking up and becoming too rough for comfortable and safe use. Depressions of excessive depth and bulges of excessive height are developing. This movement of the subgrade probably denotes over-loading due to the limited distribution of wheel loads through existing bases. It is believed that most of this trouble would be eliminated if the quality of the base material were improved.

Base Material Scarce

The Austin district is now faced with the problem of developing base materials for the next stages of construction on the primary system and for constructing the F. M. system. Apart from the existence of gravel and stone in certain areas, in general no deposits of local material have been found which will meet present flexible base specifications without the use of additives or by crushing, and frequently both are required.

During recent years successful tests have been developed whereby the available local materials can be improved by adding other materials to reduce the P. I. or improve the grading. Also dependable specifications for stabilizing base materials with cement and asphaltic materials have been developed and proven in the field by trial.

More recently use of lime to stabilize local material, particularly those having an excessive clay content, has proved successful in stabilizing granite and limestone gravels in this district. This is by no means a new idea as the U. S. Bureau of Public Roads undertook investigation of the effect of lime in earth roads in 1924. The state highway departments of Iowa and South Dakota cooperated in these tests. In 1939 the Texas Highway Laboratory set up a research project for the purpose of studying the effect of lime when mixed with clay soils.

District 14 first became interested in lime as a stabilizing agent in connection with certain U. S. 79 and 81

Editor's Note — *The 1946 highway short course held at Texas A & M College at Bryan was marked by the presentation of two related papers by W. D. Dockery and D. E. H. Manigault. Dealing with the general problem of building satisfactory roads at low cost by utilizing local materials, these papers particularly discussed recent experience with lime.*

Recently we had the opportunity of inspecting several sections of lime-stabilized roads in the clay country around Austin. In the year since the talks were prepared, lime treated roads have continued to serve satisfactorily. Meanwhile also the Texas highway department in this district has continued to use lime in patching or reworking short sections, as part of routine maintenance, and has completed or let several sizable projects.

Encouraged by these further developments we herewith present articles drawn largely from the original papers with certain data added.

During the past year, it should also be noted, waste lime stockpiles in this area have been exhausted and attention turned to commercial lime, which has advanced about one dollar per ton plus freight rate increase. Photos by the R and S editor.

★ Typical section of lime-stabilized road, Farm-to-Market road 20 near Austin, Texas—base stabilized and bituminous blade mix topping placed by H. B. Zachry Company of San Antonio

projects, after every effort to locate a material to reduce the P. I. of the existing selected material had been exhausted. As there is a scarcity of suitable flexible base material in the area, it was attempted to find an admix that would be satisfactory, and also economical, when it was noticed that large stockpiles of waste lime were available at two local lime plants. Laboratory tests indicated that waste lime or commercial lime produced satisfactory results.

Lime Reduces P.I.

For 60 samples taken from five miles of existing flexible base on U. S. 79 near Hutto, Texas, the average P. I. was 17 and the average percent of soil binder was 43. Two sections comprising .6 mile were failing badly. The average P. I. for these sections was 18 and the percent of soil binder was 35. A special job was set up providing for admixing 3% (by weight) of waste lime from McNeil, Texas, with the top 6 in. of the existing flexible base. The work was performed in August, 1945. Samples taken from the road mixed material and the completed road indicate that the resultant P. I. was 8 and the percent of soil binder was 27.

The mixing was accomplished by scarifying the existing road and windrowing one-half of material to the sides and the other half to the center of road. The center windrow was then flattened on top and the required amount of lime uniformly spread on the pile by dumping from the truck with the tail gate partially opened. The material was then bladed in and out until a uniform mixture was obtained. As it was bladed material was sprinkled to approximate optimum moisture. Addition of the lime and water made by the clay-gravel friable and easily mixed.

After the first course was compacted the remainder of the material was pulled in and worked in the same manner. After compaction the roadway was maintained in a moist condition for four days and then a triple asphalt surface was placed. The cost of treating 2,215 c. y. (compacted) was $1,350.86 or $0.71 per c. y., which would be $0.101 per sq. yd. or $0.017 per sq. yd. per in. of depth. Had commercial lime been used it would have cost $1.26 per cu. yd. or $0.21 per $0.035 per sq. yd. per in. of depth. Prices include lime, scarifying, mixing, rolling, sprinkling and curing.

Another Case

From 47 samples of existing selected material taken along 1.8 miles of U. S. 81 near Round Rock, Texas, the average P. I. was 24 and the average percent of soil binder was 39.

The repair work on U. S. 81 was done during regular maintenance operations. Due to the fact that the select material in place was of very poor quality it was decided to scarify and reshape it for use as sub-base and then place 4 in. of good material on top. A combination of materials was used as follows:

	% of Mixture	P. I.	% S. B.
Pit run gravel....	88	22	18
Caliche	12	10	79
Resultant mix ...	100	17	25

The gravel, caliche and lime were dumped on a local town street and dry-mixed by blading. The mixture was then carried to the road, wetted, compacted, moist cured and sealed with asphalt. The resultant mixture of gravel, caliche and lime had a P. I. of 5 and 22 percent soil binder. The total cost, exclusive of stripping, was about $1.38 per c. y. in place.

A section of road in Burnet and Llano counties on State Highway 29 has 6 in. of granite gravel selected material in place. Some sections were failing badly and investigation showed that the granite gravel had an average P. I. of 22 and an average percent of soil binder of 29. After admixing 3% (by weight) of waste lime, the average P. I. was 6 and percent of soil binder 22. Cost was $0.56 per c. y. of material treated, including 56 miles average haul on the lime.

Other maintenance jobs on Highway 29 in Travis County and Caldwell County included the mixing of 3% waste lime with the existing base material. This job included treating 15,750 c. y. of material at an average cost of $0.97. This relatively higher cost is attributed to the necessity of reshaping the sections several

★ After two years of service U. S. 79 N. of Austin stabilized with lime. See article for details

times due to rains during construction and the fact that a small quantity of new material was hauled in.

So far the results have been satisfactory. All these projects were completed prior to 1946, and during the past year several additional sections of highway have been similarly repaired, with similar reduction of the P. I.

Preliminary Study Needed

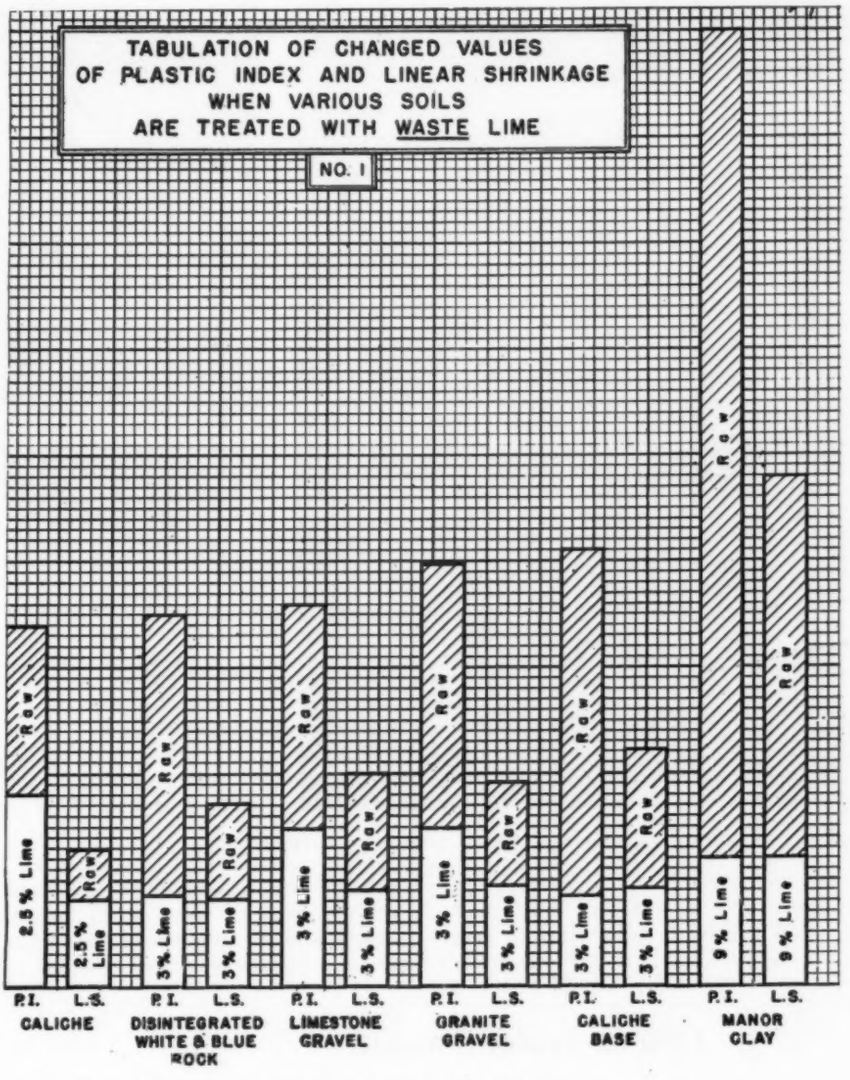
One 1945 experiment with lime was in connection with high clay content caliche from Ranch-to-Market Road 32 in Comal County. Samples of caliche were mixed in the laboratory with 2.5% to 4.0% (by weight) of waste lime from both lime plants. The McNeil plant source was the same as used for the projects described above. Addition of the lime had very little effect on the P. I. This is the first material that has failed to show the usual P. I. reduction, and it would indicate that study and preliminary investigations must be made with lime admixtures as well as other types of stabilization.

While preparing plans for 14.7 miles of Farm-to-Market Highway 20 in Bastrop County the problem of non-uniform flexible base again was developed. One pit was available near the north end of the project. The P. I. of this material ranged from 4 to 27 depending on where the sample was taken. A more satisfactory pit could not be located. Laboratory tests indicated that it would be reasonable to produce a gravel mixture from the pit with a P. I. of 15 to 20, and that 2.5% to 3% of waste lime would reduce the P. I. to below 10. The project was set up to add 2.5% to 3% by dry weight of waste lime to the gravel. The specifications required gradation control, LL not to exceed 35, P. I. not to exceed 10 and LS not to exceed 7.0.

The contract was awarded to H. B. Zachry Company of San Antonio. The contractor set up a plant to screen out oversize rock and add lime. The lime was fed through a hopper to a conveyor belt which in turn fed the lime on the main gravel belt. This plant set-up did not work for adding the lime, for two reasons: One, the waste lime was too wet to feed uniformly through the hopper; and second, the amount of gravel being fed on the main conveyor varied too much. It was then decided to add the lime on the road by road mixing. An average P. I. of 8 was obtained on the road mixed sections.

In Conclusion

A number of tests to date indicate that 2.5% to 3.0% of waste or commercial lime will generally show a reduction in the P. I. of clay binders so treated. On the other hand it is realized that the effectiveness of a lime admixture depends upon getting it uniformly distributed. The thought has been expressed that lime could be added in solution. To check this a number of laboratory jars were prepared each containing the same amount of lime. The water was varied from 100% to 700% based on dry weight of the lime. All samples were thoroughly mixed and then allowed to stand undisturbed. It was observed that the samples with 100% added water and 150% added water did not show any marked amount of settlement at one hour. The samples with more water begin to show settlement at 5 minutes. The more water the faster the rate of settlement, and at one hour all samples had settled at such a rate as to leave the lime at approximately the same height in the jars. This limited test would indicate that with as much as 150% moisture lime would stay in solution and the mixture would pump or flow through gravity spray bars. This method of adding lime has not been tried in the field.

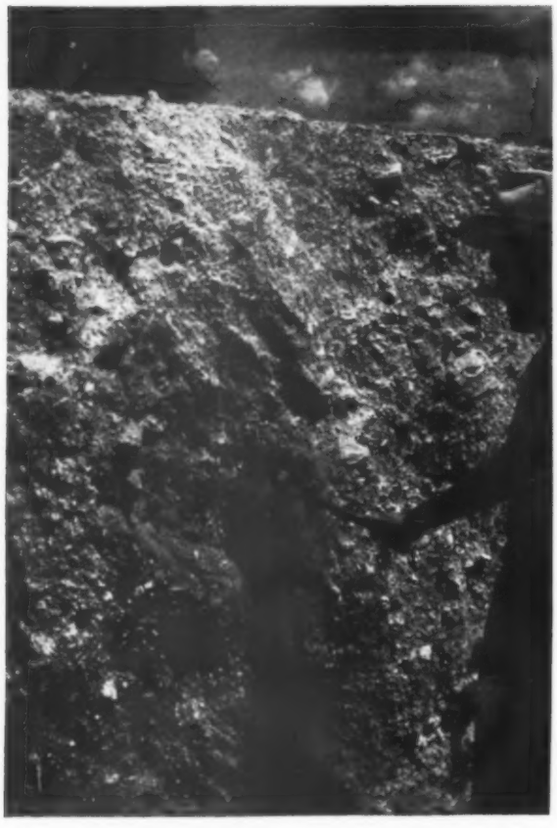


★ Chart of test results on lime admixture for soils in the Austin district

None of the test sections are old enough to say positively what the results will be. So far the results appear to be very satisfactory. Time only will tell whether lime can be used to guarantee a uniformly low P. I. when mixed with a variable P. I. material and whether the results will be permanent. Also time only will tell whether any permanent strength has been added to the base.

It would appear, at this time, that flexible bases with uniform and satisfactory quality and with perhaps more carrying capacity can be constructed provided the engineers:

1. Make thorough preliminary investigations and tests in the planning stage.
2. Acknowledge the maximum condition that can be expected.
3. Set up the plans and specifications recognizing this condition, there-



★ Close-up views, respectively, of gravel, waste lime, mixture of two

by eliminating from the contract the gamble of poor materials developing.

4. When required, set up a clear and concise bid item for treatment, not for just a satisfactory base but for a base with some safety factor. Sand, cement, lime or some other product not yet tried may be used.

II—Lime for Low Cost Roads

By D. E. H. Manigault

Research Engineer, Texas Highway Department, Austin

SHOULD there be no good material within reasonable haul, there may be a local material which can be improved by one of the admixes; either cement, asphalt, or lime. All engineers are familiar with most of these. There are records of many projects which have been built, but little information of the results obtained.

I will confine my remarks to lime, because it is less known than the others, even though it is one of the oldest of all construction materials.

Lime for some reason has been neglected by modern road builders. It was said to have been used by the ancient Romans about 2200 years ago, and they continued to use it until maintenance of the Roman roads ceased about the middle of the 7th Century. McAdam mentioned it about 120 years ago when he referred to the beneficial use of "lime-water" for filling joints between broken stones.

Why lime is not used as a stabilizer puzzles me, unless it is because of disappointments from not curing properly. It was used in South Dakota and Iowa in 1924. Texas tried several test projects but with little success, until Don L. Hook, senior resident engineer in Texas, district 14, in a desperate hunt for a cheap stabilizer, stumbled on some waste lime near Round Rock, in Williamson County, and mixed it with limestone gravel with clay binder. He was astounded at the results obtained. Since that time we have made many laboratory tests of lime used with caliche, decomposed white rock, granite gravel, sand-clay, and pure black clay from Travis County.

Improves Borderline Gravel

There is no doubt in my mind that a borderline gravel with high P. I. clay binder, unfit for use in its natural state, can be vastly improved by an admix of about 3% of lime. All the constants are greatly improved. It is easy to mix, either at the pit or on the road. The use of lime as proposed is relatively new. Therefore there are no old projects to prove how it will act through a span of years, but there are many old buildings all over Texas in which lime-mortar is still in good condition. It is only reasonable to expect lime will continue its excellent behavior.

We all know that good flexible base material is rapidly being exhausted and that the demand is always for better and better material. The most valuable service to be expected from lime is the fact that many thousands of cubic yards of doubtful clay gravel can be improved by these changes to meet all the standard tests, contributing a large increase to the purchasing value of the taxpayers' dollars.

There are also many miles of old flexible base pavements which are failing either because of faulty construction or because the flexible material has a high P. I. Lime will correct this by a simple operation at small cost. We may also add that lime is proving its value as an economical admix in extensive maintenance projects. There are at least four or five machines on the market which will thoroughly mix lime or other admixes into the base in place at a reasonable price.

The Testing Laboratory at Austin has piloted the way in our state. It shows that all soils, except gypsum and peat, can be improved by admixes of one kind or another; that

Table A—Black Soil (P.I.-41), Near Harris-Ft. Bend County Line

Mold No.	% Lime	Mod. Bearing Value 1 Day	7 Days	4 Yr. 5 Mo.	Punch Shear	Op. Moist.	Mold Moist.	PI Treat.	Density Treat.	Punch Shear 4 Yr. 5 Mo.
128	0	95	75	140	0	29	38	41	80	....
127	8.5	1050	1335	1665	900	32.5	32.3	7	81	1350
85	10.2	1250	1250	8140	800	33	32	6	81	1335

Table B—Stability Test on Mixtures of Manor Clay Plus Lime

Type and Per Cent of Lime Austin White Lime Commercial	% Mold Moist	Density in #/C.F. Dry Soil & Lime	Per Cent Moisture Absorbed	Wet Punch Shear	Punching Shear Value
0	27 to 28	82 to 85	14 to 18	50 to 80	....
8	32.9	83.7	2.4	2600	1050
10	32.0	83.1	3.3	3463	1050

Table C—Soil Constants on Raw Manor Clay and Admixtures

% Commercial Grade Austin White Lime	LL	PI	FME	SL	LS	SR	Class
0	74	45	45	12	24	2.00	A-7
8	48	7	44	32	7	1.43	A-5
10	46	6	44	33	6	1.39	A-5

further progress requires more field tests; and that various admixes should be tried under like conditions, so that some conclusion may be arrived at as to the relative value of the respective mixes.

The necessity of such tests have been discussed with a number of field engineers and the opinion is that they are essential because mixtures must be tested under field conditions.

Through all Texas we have soils which contain various percentages of clay from 100% in the black clays of the Coastal Plains to cohesionless beach sands. Pure black clay makes a good road as long as it contains only a small percentage of moisture. When water is added the clay becomes plastic and eventually reaches a point at which the plasticity is such it will no longer support a vehicle. If we could keep clay at the proper moisture we would not need any better material, but would have an excellent, cheap, easily maintained road.

We have long looked for some method of keeping clay at a uniform moisture but that is very difficult and expensive. But should we be able to change the characteristics of clay into those of a soil that will not become plastic, it is very possible we have accomplished the same results.

Typical Lab Reports

I quote Table A, from W. J. Van London's laboratory report dated Oct. 8, 1945. [Mr. Van London then district engineer at Houston].

Specimens from Table A were molded in 1941—kept in capillary tank with ring standing on edge thus subjecting them to 100% humid condition (specimens with higher lime content had formed a dry surface).

In Tables B and C I quote parts of Chester McDowell's report of R. J. Hank, Materials Engineer, Texas highway department, dated Oct. 26, 1945, on specimens of black clay from Highway 20 near Manor.

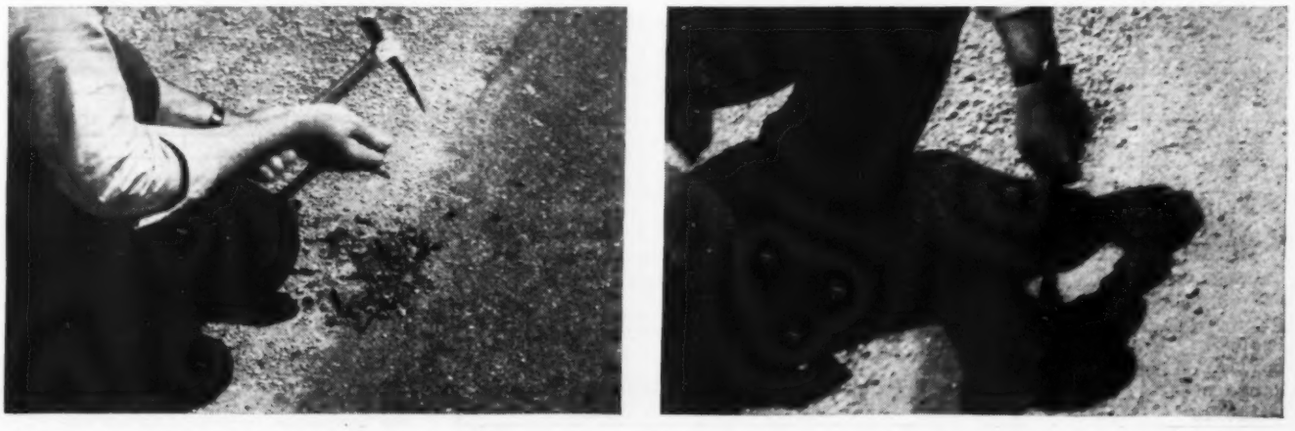
Upgrades All Soils

Thus laboratory experiments show that an admix of lime changes all the constants in clay for the better, converting an A-7 soil into an A-5 as is shown by the clay from the Harris-Ft. Bend County Line treated with 8.5% of lime. This clay after treatment no longer looks or acts like clay, but resembles a soft fine-grained sandstone. Exposure to water did not seem to hurt it, though continuous cycles of wetting and drying or freezing and thawing probably will.

Also please note particularly: P. I. reduced from 45 to 7. L. S. reduced from 24 to 7. S. R. reduced from 2.00 to 1.43 and 1.39, or about 28% to 30% reduction.

In localities where the base is continually wet from capillary water and danger of freezing is at a minimum, it is possible that a lime-stabilized clay base protected by an asphalt wearing surface will prove adequate for light traffic roads and that a similar base will add greatly to the durability of a rigid pavement or a flexible base with a light asphalt top. Should we be able to prove that lime will do this, a major step will have been taken in the economical use of local materials.

Lime now costs an average of about $15 per ton delivered at railroad sidings. This looks excessive, particularly as we can use a crude lime as satisfactorily as the commercial brands. Then why not prepare a specification to cover what we need, leaving out the unessential requirements. Limestone suitable for producing lime is abundant in several parts of Texas. Oyster shell can be delivered at almost any point on the Gulf Coast including Brownsville, Corpus Christi, Port Lavaca, Houston and Beaumont. Fuel oil, natural gas, wood, coal and lignite are cheap and widely distributed through Texas. The process of burning lime is simple; most districts should be able to produce lime conveniently and economically. I do not doubt that when the demand warrants it, contractors or someone else will find a way to furnish lime at a reasonable cost.



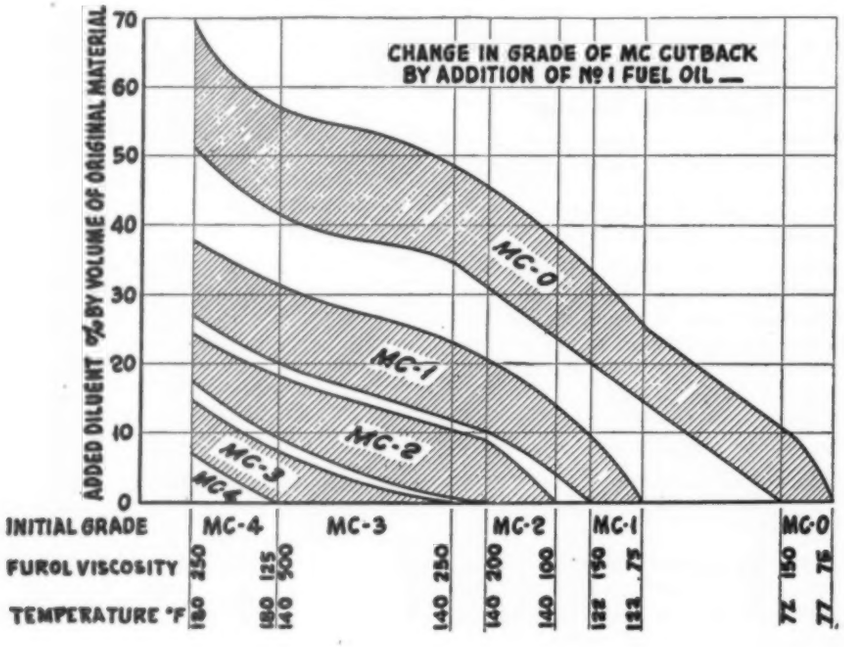
★ (Left): Crumbly material from non-stabilized shoulder at edge of blade mix topping, and (right): Well bonded and consolidated lime-stabilized base utilizing same clay. Note how latter effectively resisted light hammer blows

How Much Diluent?

to Change Cutback Grade in Emergencies

How Minnesota highway department instructs maintenance employes in determination of amount of diluent to be added to cutback asphalt to produce a lighter grade.

IT is sometimes necessary to determine the amount of diluent to be added to a cutback asphalt to produce a lighter grade. While this practice is not to be recommended for extensive use, there are times when it is expedient to prepare a small amount of material in this way. The amount of diluent to be added may be determined by trial, using the given materials in the laboratory, but this entails considerable delay. There is prepared the accompanying chart which may be used with sufficient accuracy for the general run of materials. The diluting medium should be either a No. 1 fuel oil or a kerosene, if a medium curing cutback is to be prepared.



Grade	% Residue (By Vol.) S.C.	M.C.	R.C.	Grade Tar	% Residue
0	-	60	60	RT 1-2	70
1	65	70	70	RT 3-4	75
2	70	75	75	RT 5-6	77
3	75	80	80	RT 7-8	83
4	80	85	85	RT 9-10	86
5	90	90	90	RT 11-12	90
Nature of Base Material	Road oil or soft asphalt	120 to 300 Pen. Asph.	60 to 120 Pen. Asph.	Road Tar	
Source	Petroleum	Petroleum	Petroleum	Bit. Coal	
Nature of Diluent	None of gas oil	Kerosene	Naphtha	Water Gas Tar	
Probable Boiling Range of Volatile	* 500 to 750 +	350 to 600 °F.	250 to 400 °F.	300 to 500 °F.	

★ Table A—Properties of typical bituminous materials. (*A portion may be non-volatile except under vacuum.)

Just below the heavy horizontal line the initial grade of cutback asphalt is listed. If its viscosity is not known, the center of the space for a given grade will locate the horizontal position with sufficient accuracy. If the viscosity is known, the horizontal position may be interpolated proportionately from the viscosities listed at the limits of that given grade. When the horizontal position is determined, one proceeds vertically upwards to the center of the shaded area corresponding to the desired grade. Directly opposite this point, on the vertical scale at the left of the sheet, may be read the percent of diluent required. Note that this per cent is by volume and is based on the volume of the original cut back before dilution. To prepare MC-0 from an average MC-3, the chart indicates that a volume of No. 1 fuel oil, equivalent to 45½% of the volume of the original MC-3 must be added. That is, for 1000 gal. of MC-3, add 455 gal. of No. 1 fuel oil.

In some emergencies it may be necessary to cut back AC-1 for use as tack coat material. To arrive at the amount of diluent to be added, data given in the accompanying Table A may be used. For example, it is desired to make up a material equivalent to a Grade 2. Under MC-2 it is found that the average residue is 75% or it has 100-75 or 25% diluent. Then to make up 1000 gal. of the MC-2, it would require 750 gal. of AC and 250 gal. of diluent (fuel oil No. 1 or kerosene) or, stated in per cent, there must be added 250/750 = 33⅓% of diluent to the AC-1.

Material	*Temp. °F. for 100 Sec. Furol Viscosity
MC-0, RC-0	77
RT-1	77
RT-2	90
RT-3	100
RT-4	110
RT-5	120
SC-1, MC-1, RC-1	122
RT-6	130
RT-7	142
SC-2, MC-2, RC-2	145
RT-8	154
RT-9	168
SC-3, MC-3, RC-3	170
RT-10	180
RT-11	190
SC-4, MC-4, RC-4	195
RT-12	200
SC-5, MC-5, RC-5	215
200-300 Pen. AC-1	275
85-100 Pen. AC-1	290
50-60 Pen. AC-1	310

★ Table B—This table merely illustrates the comparison between different materials, showing the approximate temperatures at which they all will have the same viscosity, or degree of fluidity

Cost Accounting Plan for County Roads

Following is a portion of the "Cost Accounting Procedure Covering Maintenance and Operation of Equipment for County Road Associations" recommended by the Accounting Committee of the County Road Association of Michigan. Reviewed as follows in "Michigan Roads and Construction," the plan was adopted, effective April 1, at the association's 1947 annual meeting, and most Michigan counties have put it into effect.

In commenting on this step, O. A. Cuthbert, engineer-director for the Association, notes that "Eventually we anticipate going further than equipment costs and having uniform and sensible accounting set-up in all 83 counties. We have had very excellent cooperation from the Michigan Auditor General's department on this initial step and Auditor General Aten has assigned one man as liaison man between his department and our counties, which cooperative step is proving very, very beneficial."

Outline of Items Comprising Equipment Costs

1. **Maintenance**—(a) Direct repair cost—Labor and parts chargeable to definite pieces of equipment; (b) Indirect repair cost—General items of repair which must be distributed against all equipment at end of year.
2. **Operating**—(a) Fuel; (b) Oil; (c) Grease; (d) Anti-Freeze.
3. **Storage**—(a) All expense in connection with storing equipment.
4. **Depreciation** — (a) Percentage of purchase price of equipment to be accumulated for replacement.

Accounting Procedure Covering Above Outline

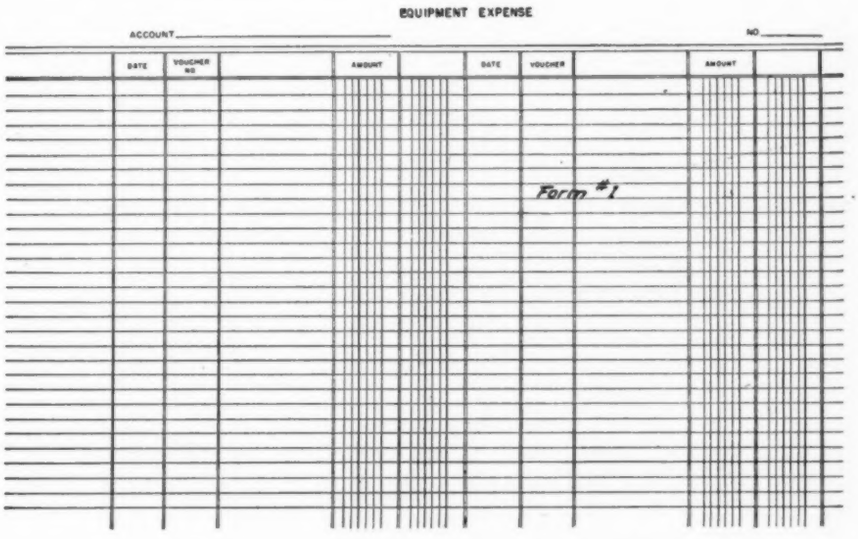
Controlling Account—Open Controlling Account called "Equipment Expense" in General Ledger to which all expenditures for equipment repair and operation should be charged.

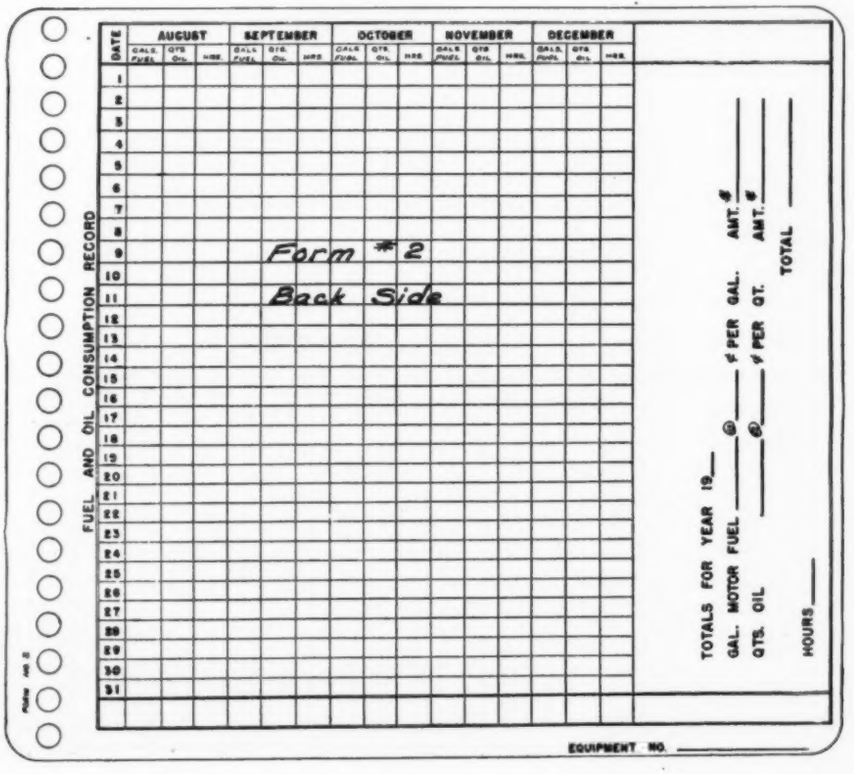
Subsidiary Equipment Expense Ledger—Detail of all "Equipment Expense" charges are recorded in subsidiary ledger and balanced with controlling account. Account should be carried for each piece of equipment, also all indirect repair, storage and operating cost items. (See Form No. 1)

Maintenance—Direct charges should be posted to equipment accounts affected. Indirect repair items should be posted to appropriate accounts and accumulated at end of year and transferred to Equipment accounts based on percentage indirect repair bears to direct repair cost. Indirect repair accounts usually are as follows:

Insurance on fleet, heating repair shops, janitor and watchman wages, janitor supplies, laundry, light, operating shop car, wrecker or pickup, power, rent of repair shop, small tools, stock clerk, stock inventory, supervision of shop, telephone, unallocated (for items not otherwise enumerated), vacations and sick leave (shop employes), water, wiping rags, repair shop equipment and buildings, depreciation—shop equipment and buildings.

Tires and tubes (including recapped or retreaded tires)—Open accounts in subsidiary ledger for different size tires and tubes used. Determine total spent on each size





ROAD COMMISSION

EQUIPMENT RECORD

EQUIP. NO. _____

TYPE OF EQUIP. _____

MAKE _____ MFG'D BY _____

PURCHASED FOR _____ DEPT. PURCHASED FROM _____

SEC. A	SEC. B
DATE PURCHASED	EQUIPPED WITH
COST—NET _____ ALLOW ON TRADE-IN _____ TOTAL $ _____	
COST OF EQUIPMENT SHOWN IN SEC. "B"	
TOTAL COST $	
MODEL	SIZE
SERIAL NO.	MFG'D BY
ENGINE NO. NO. PISTONS BORE STROKE	PURCHASED FROM
YEAR BUILT CU. IN. DISPLACEMENT	DATE INSTALLED
EQUIPMENT CLASSIFICATION	COST $
TIRES—FRONT REAR SINGLE DUAL	
	DISPOSITION
DISPOSITION	DATE
DATE	AMOUNT OF SALE $
AMOUNT OF SALE $	

Form #4
Front Side

SEC. C	SEC. D
HOIST	ALTERATIONS
MAKE MFG'D BY	
TYPE NO.	
BOX	
TYPE NO. SIZE	
MFG'D BY	
PROCURED FROM	
DISPOSITION	
DATE	
AMOUNT OF SALE $	

EQUIP. NO. _____ YEARLY RECORD OF COSTS

YEAR	ENGINE USED	MILES	MAINTENANCE: DIRECT REPAIRS	MAINTENANCE: INDIRECT REPAIRS	MAINTENANCE: TOTAL	OPERATING EXPENSE	STORAGE	DEPRECIATION	TOTAL COST	HOURS	COST PER HOUR	HOURLY RENTAL RATE	TOTAL RENTAL EARNED	NET PROFIT OR LOSS
TOTALS														

Form #4
Back Side

ROAD COMMISSION

DISTRIBUTION OF EQUIPMENT COSTS FOR 19___

EQUIPMENT	NO.	EQUIPMENT CLASSIFICATION	MAINTENANCE: DIRECT REPAIRS	MAINTENANCE: INDIRECT REPAIRS	MAINTENANCE: TOTAL	OPERATING EXPENSE	STORAGE	DEPRECIATION	TOTAL COST	HOURS	COST PER HOUR	HOURLY RENTAL RATE	TOTAL RENTAL EARNED	NET PROFIT OR LOSS

Form #3

at end of year and pro-rate cost to equipment on basis of hours operated. (Tire chains may be included with tires if better distribution method is not available.)

Operating—Operators wages are eliminated in this cost analysis. Therefore, the remaining items of operation expense are—fuel, motor oil, grease, anti-freeze.

Most counties purchase these materials in large quantities and place them in stock accounts. It is then transferred from stock to equipment. Counties generally own many pieces of equipment, and a great deal of posting is necessary to distribute these items of operating cost.

The following method will reduce detail to a minimum and will be satisfactorily accurate:

1. Determine total cost of operating materials used for year by opening accounts for them in Equipment Expense Ledger.
2. At end of year divide total cost of each material by quantities used and obtain average cost price for year.
3. Keep record in quantity only of material used in each piece of equipment. Also hours equipment operates.
4. Multiply quantity used by average unit price to obtain charge against each piece of equipment for year.

The above method refers particularly to fuel and motor oil. It has been found that it is practically impossible to obtain an accurate distribution of grease. This is true to a lesser extent of anti-freeze. Therefore, unless a county has a very accurate system, the cost of grease and anti-freeze may be added to the oil cost and be distributed to equipment in that manner.

The cost of distributing gasoline, oil, etc., and the repair of pumps, tanks, etc., should be added to the cost of the materials affected, and thus be included in establishing the unit cost of material for a year.

Storage—The item of storage is a considerable factor of equipment expense, especially in the counties that maintain several storage garages. The cost of storage equipment cannot be considered as a repair cost. Therefore, a separate classification is advisable.

At the end of year, accumulate all the accounts in Subsidiary Equipment Expense Ledger which pertain to storage. Add them together. Divide total between number of pieces of equipment actually stored to arrive at unit cost.

The following accounts make up the cost of storage and apply only to buildings used for storage: depreciation, insurance, heating, fire protection, janitor wages, janitor supplies, lighting.

Depreciation—A straight line rate of depreciation is used.

All equipment is depreciated in eight years, excepting equipment listed below.

The following equipment is depreciated in five years: automobiles, panel trucks, pickups, trucks—of less than 419 cu. in, displacement.

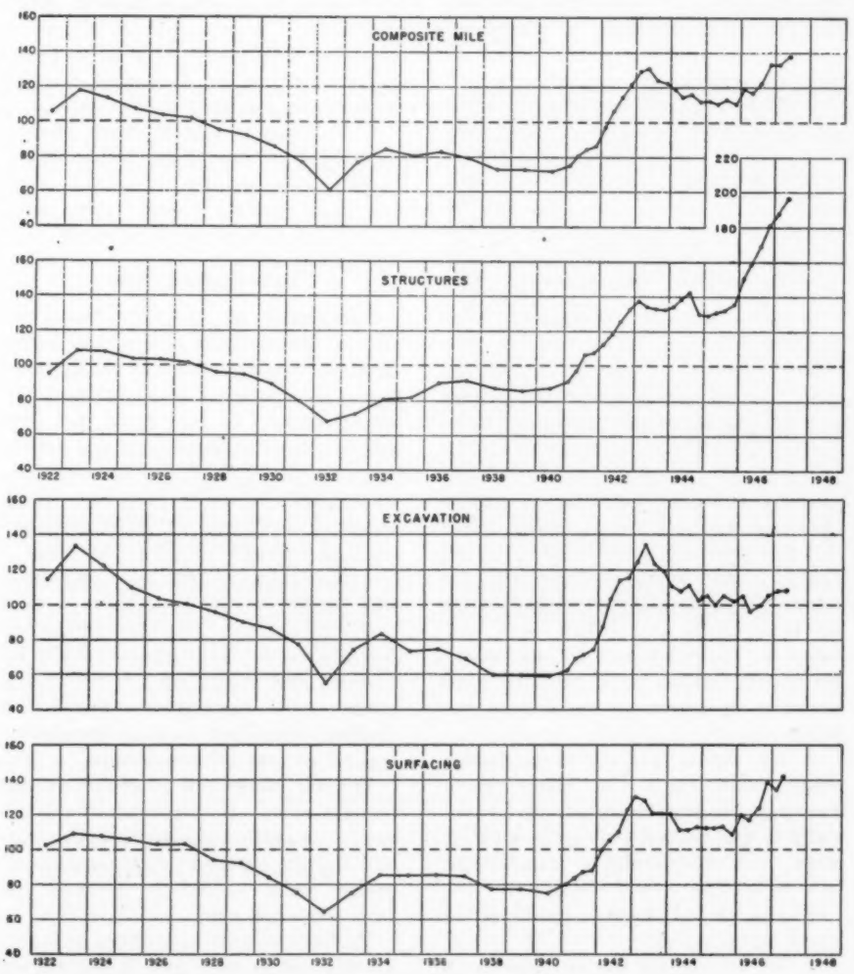
Road Construction Price Peak Reached?

Construction prices are still at or near their postwar high, according to indices compiled by the Public Roads Administration on federal-aid road awards. Published herewith are charts of PRA's Composite Mile Index, based on assumed quantities per mile of "standard" construction.

Of particular interest is the smaller tabulation, which shows the same figures converted to different base periods and shows the trends for both quarters of this year. Common excavation is slightly lower in the second quarter, but still 5.6% ahead of 1946. Other items are mostly higher, the composite index being 3.3% higher for the 2nd quarter than the first.

Composite average unit prices for 2nd quarter 1947: Common $0.38, concrete pavement $3.14, reinforcing steel $0.126, structural concrete $46.14.

Item	Comparison 2nd Quarter, 1947			1st Quarter, 1947
	1925-29 Base = 100	1940 Base = 100	1946 Base = 100	1946 Base = 100
Common excavation	108.3	181.0	105.6	106.3
Concrete pavement	141.6	186.9	112.9	108.3
Reinforcing steel	176.9	204.4	122.7	117.3
Structural steel	188.1	200.0	111.5	118.6
Structural concrete	208.3	240.7	118.9	111.8%
Structures	196.5	224.3	119.3	114.2%
Composite mile	138.0	192.7	112.3	109.0%



Price Trends in Highway Construction

★ Averages for 1925-29 period taken as base for these charts prepared by Public Roads Administrations

Meetings Ahead

American Association of State Highway Officials—Annual convention, Waldorf-Astoria Hotel, New York, N. Y.; executive meeting, Sept. 21; general meeting, Sept. 22-26.

●

Associated General Contractors of America, Inc.—29th Annual convention, Dallas, Texas, Feb. 9-12, 1948. (Fall meeting of governing and advisory boards, Des Moines, Sept. 29-Oct. 1.)

●

Institute of Traffic Engineers—18th Annual meeting, Hotel Fort Shelby, Detroit, Mich.; Oct. 1-4.

●

American Public Works Association—Annual Public Works Congress, Jacksonville, Fla.; George Washington Hotel, Oct. 6-8.

Money-Saving Ideas on

Excavator Upkeep

Condensed from "Ideas" Booklet Put Out by *"Bucyrus-Erie Company"*

THE efficiency and life of your excavator depend on two things —the quality built into it, and the operator. Little things can mean many dollars difference in the long run. Little neglects, oversights in the handling and maintenance of equipment can add up to quite a sizable sum on the debit side, and conversely a little foresight, a little extra care and the know-how, can move the decimal point to the left on the credit side.

Important Adjustments

Proper adjustments save time, work and money. The best of machines can't do its part with sloppy adjustments. The mechanic who services the excavator has an equally important job.

1. *He should* adjust clutches at normal operating temperatures; reverse bands to distribute wear when dead-end has worn off about one-third. He should avoid using compounds on bands. Bands and housings should be kept clean and when pins and holes on control levers become worn, he should install new oversize pins or build up parts by welding to remove play.

2. *He should not* let brake bands wear down until the rivets score housing. He should adjust them carefully to get a sure, safe grip, making sure that they release freely and evenly all the way around.

3. *He should* keep boom-hoist in good adjustment.

4. *He should* use the shortest latch adjustment that will catch and hold securely. No dipper-trip mechanism can function properly with a worn out latch. The mechanic should replace latch and keeper or rebuild metal when necessary.

5. *He should see that* crowd chains or ropes are always adjusted fairly snug.

6. *He should* keep cat belts as loose as possible without losing proper tracking of the driving tumblers.

7. *He should* adjust drive chains carefully. A too tight chain wears rapidly, a chain too loose will slap and may result in destructive jerks when load is applied or released.

Lubrication Tips

Lubrication is one of the most important single items in machine maintenance. Sloppy or incorrect lubrication is as bad as no lubrication. Lubricants should be kept clean, for dirt and grit in a lubricant make a grinding compound. Instead of reducing wear, such a compound cuts away precious steel and wrecks smoothly running adjustment.

Attention to a few rules of thumb will pay off in the long run.

Oil and grease should be checked for cleanness. Lubricants should be covered and stored neatly in a clean place. Oil enclosures should be drained when hot so that the draining oil carries off the sludge.

Funnels, plugs and oil spouts should be kept clean. Empty containers that are to be refilled should be kept clean and tightly covered. The outsides of grease guns should be cleaned before they are used.

Fittings should be cleaned prior to lubrication so that grit is not forced in with grease. When open or sleeve-type bearings are greased, the excess grease forced out of bearing should be wiped off.

Only good lubricants should be used and on a regular schedule of lubrication in accordance with manufacturer's chart.

Only the right amount of lubricant should be used; too much may be harmful. A good lubricant in the wrong place may do more harm than good. Graphite grease should not be used in ball or roller bearings.

The oiler should be thrifty of lubricants. However, when forcing lubricants through a bearing it is good policy to force out the old lubricant at the other side to clean out the dirt.

Where possible, parts should be turned to change load direction then greased again. Roller chains should be oiled with a light oil and lubricant should be worked in around pins by working chain back and forth.

It is important to remember that a bearing will overheat for reasons other than no lubricant. Too much lubricant, if in a tight enclosure, or the wrong type of lubricant, or mechanical trouble can produce the same effect.

A thorough understanding should be established as to who is responsible for lubrication. It should be done at the beginning of shifts, except any engine crank-case or gear-case oil changes, which are best handled at noon when oil is at maximum temperature. Water resistant greases should be used outside where parts are subjected to ground water and weather.

Not on the Charts

What to lubricate and when are usually covered in manufacturers' charts, but not all useful knowledge is on paper.

Crawler, for instance, should be lubricated regularly, even when the machine is only being moved up occasionally. When track rollers are lubed, the old lubricant should be flushed out of bearings.

In travel, cats should be lubricated every two miles, that is, the smaller machines. The larger ones should be taken care of even more often.

Tread pins should be lubricated. Try it on *your* job and watch results. Drained crank-case oil should be used.

Ropes, with the exception of drag-ropes on dragline, and drum faces should be lubricated regularly. Work lubricant into rope. Suspension ropes should be lubed, even when boomhoist is not used.

The swing rack should not be missed. It is often neglected on machines with internal racks. Only a quarter to one half of this giant gear is getting practically all the wear.

Hook roller paths should receive a tacky type of lubrication compound with high surface tension that is resistant to dust. When it becomes cakey and gritty it should be scraped and cleaned off with a kerosene-soaked rag and replaced with a clean lubricant. Care should be taken that old grease does not pack and harden, thus preventing rollers from turning.

The way a machine is operated, even by an experienced operator determines much of the life of an excavator.

Operators' Check-List

If you are an operator, ask yourself the following:

Do you make short moves often to maintain the most efficient digging angle? Do you avoid working the bank out to the end of your sticks?

Do you keep your machine on solid footing the full length of both cats? If there is a hump, do you dig it out or move around it?

Do you leave your machine over night or week-end on a bank or low spot where it might be flooded, or have the footing washed out from under it?

When moving on hills, do you block your cats safely before shifting out of gear on all jaw-clutch machines, or do you take a chance of your machine running away?

Do you work shovel with your drive chains away from digging and chains front on dragline or dragshovel?

Do you take chances?

•

National Crushed Stone Association announces the removal of its offices and research laboratory, effective July 21, 1947, to 1415 Elliot Place, N.W., Washington 7, D. C., telephone Woodley 1536.

Maintenance and Repair Tips

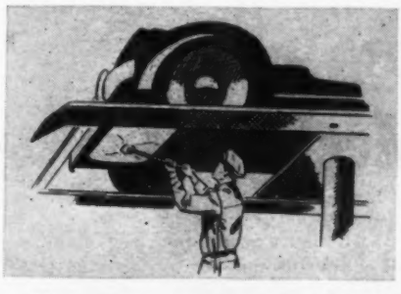
Thanks to "Paint Shop Digest" and "Industrial Review" published by Industrial Tape Corporation

Taking Care of Your Spray Gun Pays in longer, better service. So clean your gun right after using it and avoid long soakings in cleaning solution. *Never* run a wire through the fluid opening. Instead, put solvent or naptha in the cup and spray it through. Then, blow compressed air through it.

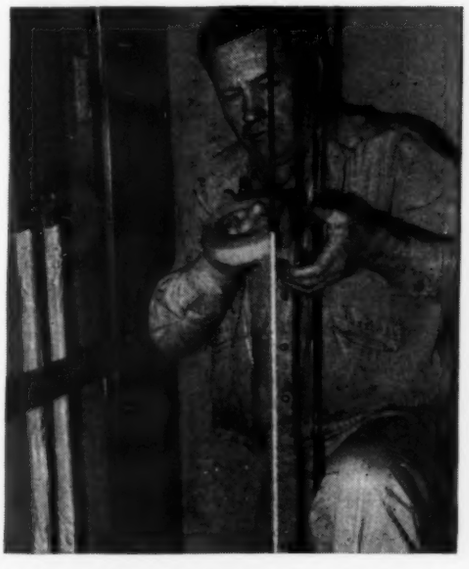
To Reshape a Bent-Up Gas-Tank Bottom, use this trick. Solder a piece of welding rod to the contact area. Then pull or pry down on rod.

Use a Fresh End of a Welding Rod to Weld the edges of a flange. A fresh end makes a much stronger weld than a burned end. Take your pliers and cut off the burned end when you start to weld a flange.

Remove Window Scratches by mixing a paste of glycerine, water and iron oxide to the consistency you desire. Apply mixture to the scratches with a hard felt pad. Rub vigorously back and forth over the scratches until they disappear. Then remove the paste with water. If the scratches do not come out, emery powder mixed with glycerine will do it.



When You Are Electric Welding close to other metal parts that may be burned or damaged by the arc, wrap all exposed parts with a safe masking tape. A few minutes in time and tape will save dollars in replacing damaged parts.



Philippines Plan $40,000,000 Roads

Highway traffic leading out of Manila has reached such proportions that American engineers are studying plans for building super-highways to handle the traffic flow.

Francis C. Turner, chief of the U. S. Public Roads Administration, administering a $40,000,000 road and bridge rehabilitation program which America is presenting to the Filipino people, said that traffic on the Manila North Road (highway No. 3) had reached 8,000 cars and trucks daily.

When the U. S. 37th Division and First Cavalry came down it two years ago the road was deserted. Now constant traffic jams and snarls can be remedied only by widening the road to four or more lanes, Turner said.

★ New business headquarters of Louis Garavaglia, of Detroit, is typical of the trend toward neater, more modern appearing shops and yards among the contracting fraternity

★ Louis Garavaglia, Senior, founder of the firm, photographed while inspecting the new premises. His son Louis, Jr., is now the president, and the "Old Man," as he calls himself, seems to be taking it easy and showing quite a bit of pride in son's doin's

Detroit Contractor Builds Spacious Garage, Shop

An up-and-coming earth-moving contractor of Detroit, Louis Garavaglia, recently completed this modern 80 x 120 ft. fireproof garage as part of his plans for business expansion. Located along a convenient arterial and near rail sidings on the city's outskirts, it opens onto a 9-acre yard, large enough to house paving as well as earth-moving equipment, plus a couple of crushing plants, in case all the firm's equipment ever had to be brought home at the same time.

The building is of brick and steel construction, and has concrete floors, clearance height of 18 ft., and large rear doors which permit crushers, pavers or other large equipment to be taken inside for repairs. Looks like about 100,000 bucks invested here. Garavaglia expects to add machine shop and motor repair equipment during the coming year.

Louis Garavaglia, Jr., now president of the firm, recently bought up a passel of army 6 x 6 trucks with enclosed "radio car" bodies. They say he made a nice deal, and found plenty of chances to re-sell both bodies and trucks—or does he figger on using this means of making sure he has plenty of serviceable trucks to begin the season with?

Safety Ideas for Garage Mechanics

National Safety Council, Construction Safety Card No. 82.

DON'T ever let it be said that you were responsible for a vehicle accident because you neglected to do your work properly. It is equally important that you keep yourself safe while on the job. Read and heed these suggestions:

1. Never depend on jacks or chain hoists alone to support a car you have to work under. Block it.

2. Use only electric extension lamps and portable electric tools with cords and fittings that are in good condition.

3. Be sure your feet are clear of passing automobiles or moving machinery when you get under a car.

4. Guard against carbon monoxide gas from the exhausts of running engines. See that there is proper ventilation.

5. Do not have gasoline standing around in open containers. Use kerosene or other relatively safe preparations to clean parts whenever possible.

6. Use safety grip (thumb not around handle) when necessary to crank engines by hand.

7. Don't attempt to lift anything too heavy for you. Get help or use a hoist.

8. Watch the wrenches and other tools you use. Keep them in safe working condition.

9. Keep a pair of safety goggles handy and wear them when doing work in which eye protection is needed.

10. Keep aisles and open spaces on floor free of tools and parts.

11. Be on your guard against flashes or explosions of gasoline vapors, anti-freeze solution vapors and hydrogen from storage batteries. Keep flames and sparks away.

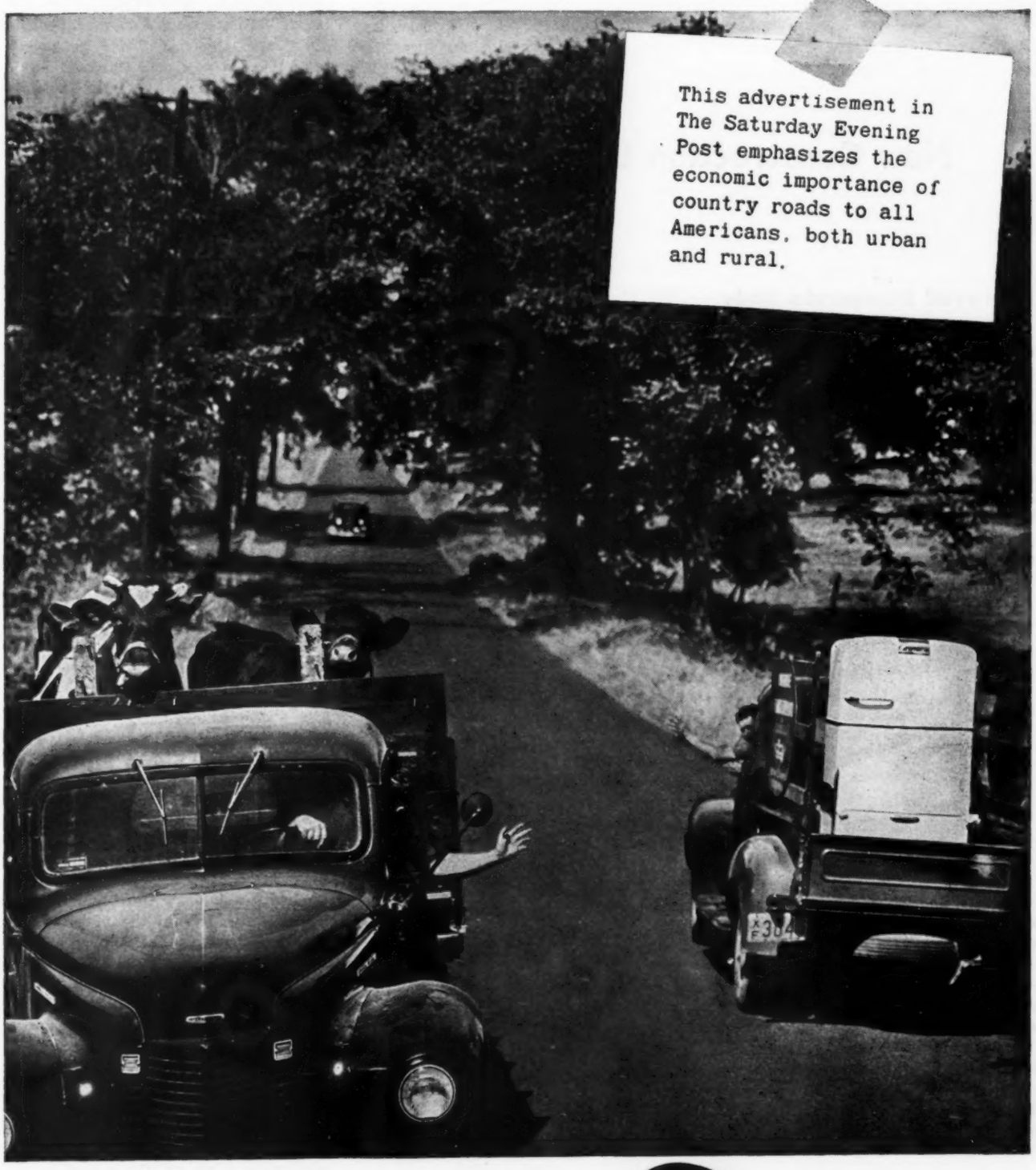
12. If your clothes become soaked with oil or gasoline, change them. Don't take the risk of catching on fire.

13. Never consider a job complete until you have checked to make sure all the lock washers and cotter pins are in place.

14. Never allow grease and oil to remain on floor where you and others might slip on it and fall.

15. Always keep a suitable fire extinguisher at hand and ready for use.

FARM-TO-MARKET ROADS are *two-way* trade routes. They carry food to cities; manufactured goods to farms. Important to highway officials and engineers in the development of these vital roads is Barrett-Tarvia* road tar, a dependable and economical all-purpose paving material.



HOW BARRETT SERVES THE ROAD BUILDING INDUSTRY. Barrett Tarvia* road tar and Tarvia-lithic* bituminous concrete, which have long been favored paving materials of road officials and engineers, meet almost every requirement for dependable, low-cost road construction, maintenance and repair. Barrett also makes Wood Preservatives for guard rails and bridges, Protective Coatings for culverts and underground pipe, and Waterproofing for viaducts and tunnels. These and other Barrett basic products establish Barrett as **ONE OF AMERICA'S GREAT BASIC BUSINESSES.**

Barrett

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

*Reg. U. S. Pat. Off.

TIP TO ROAD MEN: If any of the country roads in your territory need attention, ask the Barrett field man for suggestions. He can help you.

New Construction Equipment and Materials

1
Improved Dumpcrete Body

Several improvements have been made in the 2-yd. Dumpcrete body of Maxon Construction Co., Inc., Dayton, O. This is a specially designed watertight body for hauling air-entrained concrete and other materials. The discharge height was increased to a point over 5 ft. off the ground; the chute assembly can now be quickly and easily swung away to either side when desiring to dump sand and gravel or concrete without using the chute; steel plate running boards

2-Yd. Dumpcrete

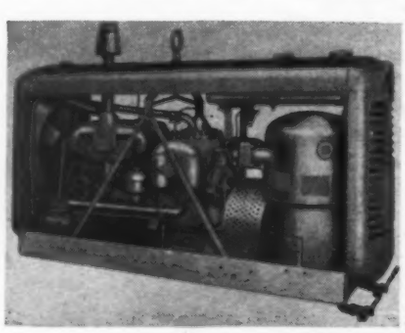
have been added to provide protection from road dirt and can be used as a platform for operating the discharge controls. A new size Dumpcrete is now in production. It will have a 3 cu. yd. rated concrete capacity and a water level capacity of 5 cu. yds. The same features added to the 2-yd. size will also be available as standard equipment on the new 3-yd. size. In addition to these two models, a 4-yd. body is also being produced.

2
New Sparkproof Cable

A new cable that will not spark when short circuited has been developed to aid in prevention of coal mine explosions. The new feature of the cable is a fine strand of copper wire embedded between the inner and outer layers of insulation. In the event of damage to the insulation the fine wire catches incipient current leakage before an arc can occur and carries it to a sensitive circuit breaker which cuts off the power. The cable was developed jointly by engineers of United States Rubber Co., New York, N. Y., and Leonard Wilson of Kenilworth Mines of Utah. It is expected to eliminate a common source of danger in coal mines. This type of cable is used to carry power to heavy equipment employed in digging and transporting coal. The cable, trailing on the ground, is in constant danger of being damaged.

3
New Air Compressor

A new "Airmaster" Compressor, the "105" utility has been announced by Le Roi Co., Milwaukee, Wis. Entirely self contained and light in weight (1700 lbs.), it has been specifically designed for either back or cab or on the platform of utility trucks.



New "105" Utility Compressor

Mail Inserted Card

For data on equipment described on these pages. See also inquiry blank on page 117.

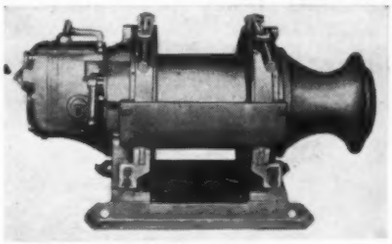
Floor area required is only 82 x 25 in. The engine used is the Le Roi D226 featuring replaceable cylinder sleeves, precision bearings, overhead valves, pressure lubrication, and magneto ignition. The liquid cooled compressor is built integrally into the engine block and also has replaceable cylinder sleeves and precision bearings. The cylinder head and valves are identical to those employed in Le Roi Airmaster compressors. The new utility compressor is regulated by the Le Roi patented Econtrol governing compressor capacity automatically according to the demand for air. A lifting bail, 6-volt electric starting system, and the exclusive electric hourmeter on a centralized control panel are all supplied as standard equipment.

4
Wax for Snow Plows

A wax developed especially for preventing snow sticking to the plow and wing surfaces is the newest product for the highway field of Pennsylvania Refining Co., Cleveland, O. An application of snow plow wax to the working surfaces of the plow before each storm, with an ordinary paint brush, is stated to maintain a hard, slick finish for hours. This finish is claimed to permit snow to slide off quickly and easily thereby preventing those troublesome accumulations. The product is also recommended for application on the knives and hoppers of rotary plows. The manufacturer says that 1 gal. of wax will put a tough, glossy finish on approximately 300 sq. ft. of surface at a cost of less than 1¼c per square foot. Prevention of snow from piling up on the plow of course, enables the plow to clear more road miles per hour and eliminates costly breakdowns that result from overloading. Snow plow wax is packaged in 2-gal. cans, 5-gal. pails, and all sizes of drums.

5
New Utility Winch

New utility winches have been brought out by Chicago Pneumatic Tool Co., New York, N. Y. Outstanding improvement over former winch design is the precision control of these new CP utility winches. The bouncing and jerking of loads are stated to be eliminated by the smooth steady action of this winch. It is stated that it loads up to a ton in weight and as far as 1100 ft. away can be handled with ease and precision. An exclusive feature of CP winches is



New CP Utility Winch

a combination cathead and drum arrangement (shown in the cut) by means of which the cathead can be operated independently of the cable drum. Thus a load can be held aloft by the drum cable and maneuvered by the cathead rope. CP winches can be furnished with air, electric, or gasoline power. The air motor is interchangeable with any standard flange-mounted 7½ HP electric motor, simply by removing six cap screws. Controls are limited to a clutch lever and a brake lever, with a safety lock for use in case of power failure. Speed of the drug is 125 fpm at 80 psi air pressure.

6
New Electrodes

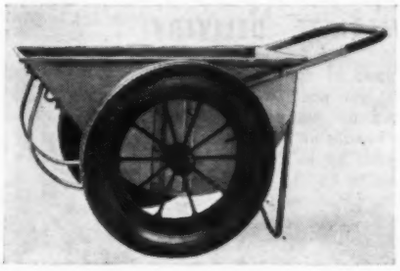
Two new steel electrodes called "Low Temperature" EutecTrodes 66 AC and 660 DC, for arc welding steel at low base metal heat, have been developed by Eutectic Welding Alloys Corp., New York, N. Y. They are flux-coated universal electrodes for superior welding of all types of steel. They produce a smooth, high tensile, crack-resistant weld, and are particularly suitable for vertical position welding. For the troublesome job of welding low carbon steel to high carbon, EutecTrode 66 can be successfully used. Being a universal rod for all types of steel, EutecTrode 66 eliminates the necessity for determining the base metal before welding. Preheating is unnecessary when using EutecTrode 66. EutecTrode 66 is available in sizes 3/16 in., 5/32 in., ⅛ in., and 3/32 in. diameter.

7
New Weed Killer

Since the advent of 2-4D weed killers, there has been a rising demand for some way of proving that an area has been sprayed. The answer is now claimed to have been found in Weed Marker—the new 2-4D weed killer developed by the D-V Laboratories, Cedar Rapids, Iowa. Patents are now pending on Weed Marker, which leaves a faint white residue on broad leaf weeds, killing them and destroying the roots. This marking of the weeds which have been sprayed eliminates double spraying, yet makes sure that the entire area has been covered.

8
New Concrete Buggy

A new concrete buggy with rocker design making for easy dumping and eliminating all kick back when buggy is tipped over has been placed on the market by Muller Machinery Co., Inc., Metuchen, N. J. The buggy, with a capacity of 6½ cu. ft. is equipped



New Muller 6½ cu. ft. Concrete Buggy

with roller bearings, 2-ply or 4-ply pneumatic tires, and 10 spoke steel wheels. The unit is of the nesting type with full-welded seams and is equipped with a towing eye.

9
New Earthmoving Combination

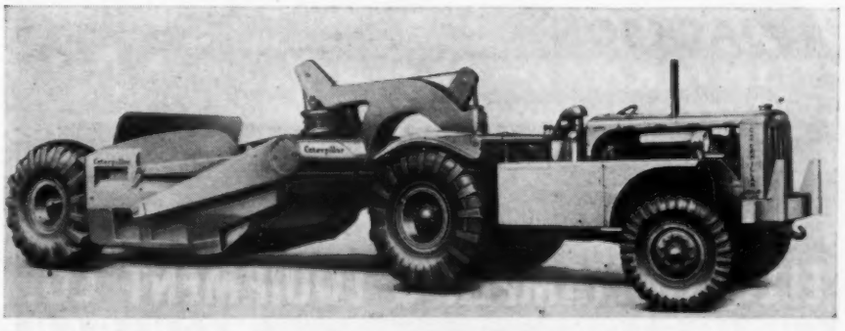
A new earthmoving team, with components matched in design and power to assure maximum efficiency of operation and working ability, has been introduced by Caterpillar Tractor Co., Peoria, Ill., with the announcement of production of a new "Caterpillar" Diesel DW10 wheel-type tractor, a new "Caterpillar" No. 10 scraper and a new "Caterpillar" No. 21 cable control unit.

Notable advantages of the new DW10 over the predecessor model, as cutlined by the manufacturer include: 15% increase in power output made possible through application of the new 6-cylinder "Caterpillar" Diesel engine. Improved double plate, semi-metallic faced clutch, equipped with heavy springs. Constant mesh transmission with helical gears in all but low and reverse with five forward speeds. Self adjusting clutch brake to facilitate gear shifting. Roller bearings on all driven gears are pressure lubricated from a gear type pump mounted on the front of the lower transmission shaft. Spiral bevel gears to provide quiet operation at hauling speeds.

The new tractor has a power output of 115 h.p. at 1800 r.p.m. Top speed of the unit with loaded wagon and scraper is 18.8 m.p.h. with standard transmission and 21.6 or 24.5 with optional transmissions, when equipped with 21.00 x 25 tires. When using 18.00 x 25 tires, top speeds of 17.6, 20.2 or 22.9 m.p.h. are developed.

The new "Caterpillar" No. 10 scraper is designed exclusively for use with the new tractor. It has a heaped capacity (at 1.1 slope) of 11 cu. yds. and embodies such recognized features as open-bowl design; high apron lift; positive, forward ejection; long cable life from correct reeving with large diameter precision-grooved sheaves; self-sharpening cutting edges.

The new "Caterpillar" No. 21 rear-mounted, double drum cable control is matched to the requirements of the new tractor and scraper. Line pulls are ample to meet the most severe service requirements imposed by scraper operation. F.P.M. line speed, bare drum, is 401 and with full drum, 615. The drum has a 9-in. diameter, 5-in. length, 15-in. flange diameter



Diesel DW10 Tractor with No. 21 cable control and No. 10 scraper

and a capacity of 150 feet of ½-in. cable. Each clutch has 12 facings with friction surface areas of 564 sq. in. The effective brake area is 111 sq. in.

10
Portable Lighting Outfit

A portable 3000-watt light tower and generator rig for lighting night construction operations has been developed by Arrow Supply Co., Pittsburgh, Pa. Mounted in ½-ton all-steel Bantam utility trailers manufactured by the American Bantam Car Co., Butler, Pa., these new lighting outfits already are being used on

Light Outfit in ½-Ton Bantam Trailer. Tower folded ready for transportation

some Pennsylvania state highway projects. The welded steel tower operates on a hinge fastened to the trailer canopy. On top of the tower are two 1500-watt clear globes in reflectors. When erected, the tower is 18 ft. in height; when folded, it has approximately 9 ft. road clearance. The lights are pivot-mounted and have adjustable beam and spread. Welded to the steel bed of the Bantam trailer is a gasoline-powered generator, manufactured by D. W. Onan & Sons, Minneapolis, Minn. It has a 5-gal. fuel tank and can be started automatically, providing AC power for the lights almost instantaneously. A 12-volt circuit for battery charging also is included. The generator weighs approximately 460 lb. and the tower and other equipment total about 440 lb.

11
Anti-Rust Paint

Rustrem, anti-rust paint, a product of Speco, Inc., Cleveland, O. is now available in aluminum as well as black. This new paint, according to the manufacturer, can be applied right over rust without brushing or scraping. It is reputed to immediately penetrate the rust layer, render it inactive and seal the surface against further rusting. Other features

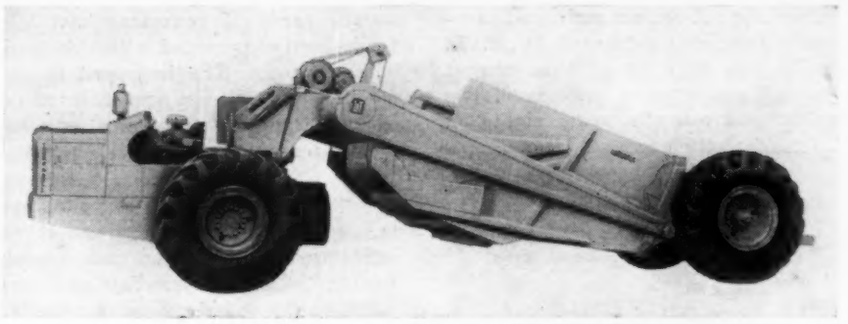
claimed are high resistance to chemical action and immunity to climatic changes. It is especially recommended for use under water, in salt water, or in locations where dampness and moisture are ever present. Rustrem Aluminum can be painted over with any high quality paint or enamel.

12
New Electrode

A new electrode, "Hobart No. 13," designed to simplify the welding of light gauge mild steel, has been announced by Hobart Brothers Co., Troy, O. Low penetration, ease of handling and steady uniform transfer of metal are claimed to make this electrode extra fast for out of position welding on light gauge sheet metal. It is also recommended for welding light sections of mild steel to heavier ones. This electrode is designed for use with DC straight polarity or AC, and is available in 1/16 in., 5/64 in., 3/32 in. and ⅛ in. diameters.

13
New Tournapull

Another model, the 35-ton capacity Model B Tournapull, has been added to the line of earthmoving equipment of R. G. Le Tourneau, Inc., Peoria, Ill. Powered by a 225 HP Diesel engine,



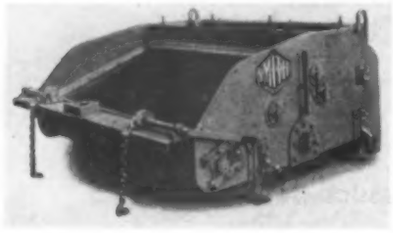
Model B Tournapull with E-35 Carryall Scraper

this prime mover is available for use with two sizes of Scrapers—the new E-35 Carryall, having a 35 ton (26.1 yd. struck) capacity, or the 25-ton E-25 Carryall (16.5 yd. struck capacity). Designed for fast hauling, the unit has 4 speeds forward, 2 in reverse and travels up to 15 miles per hour. New developments in the design of the Tournapull include electric control, Tournamatic constant-mesh transmission and Tournamatic differential. Tournapull steering, Carryall bowl, apron and tailgate are all controlled by individual electric motors. These Tournatorque electric motors are specifically designed and built to handle heavy construction work. Tournamatic constant-mesh transmission does away with the ordinary foot clutch. The newly designed torque proportioning Tournamatic differential automatically supplies the most power to drive wheel having the firmest footing. Other outstanding features on the new Model B Tournapull include positive power steering and 24.00x29 tapered bead tires. Overall specifications of the new B Tournapull with E-35 Carryall are: length 37 ft. 6 in.; height 11 ft. 3 in.; width 11 ft. 7 in.; wheelbase 23 ft. 8½ in.; minimum turning radius 33 ft., and empty weight 20¼ tons. This unit can make a 90 degree turn in either direction.

14
New Cement Spreader

A new machine for spreading bulk

cement for soil-cement stabilized pavements has been perfected by T. L. Smith Co., Milwaukee, Wis., cement mixer manufacturers since 1900. The patent and manufacturing rights on



Smith Bulk Cement Spreader

the cement spreader were acquired by The T. L. Smith Co. from B. H. Flynn, a Louisiana contractor, and manufacturer. Mr. Flynn invented and developed this machine in connection with paving contracts in Louisiana. It is said that more than a million square yards of pavement have already been constructed with this type of equipment. The improved Smith model retains all the proven features of the Flynn cement spreader, plus added features such as electrically welded frame, enclosed reversing transmission, pre-stretched endless belt, self-aligning bearings and other refinements. A typical soil-cement job requires the spreading of from 1,000 to 1,500 bbl. of cement daily. If bag cement is used, from 15 to 25 laborers are needed to place the bags and spread the cement. With a Smith bulk cement spreader, the company claims only two men are needed and the cement is spread more uniformly, in less time, at a material saving in cost. On several jobs, the machine has spread cement with an accuracy substantially better than required in the specifications.

15

New Impactor

A new impacting machine that handles like a lawn-mower has recently been announced under the trade-name Wayer Impactor. The new machine is a one-man unit that taps to maximum density such materials as asphalt, concrete, resurfacing and patching materials, etc. It is also used

Wayer Impactor

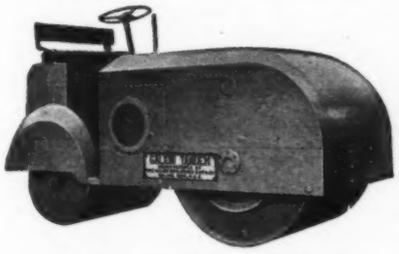
to pack down gravel, stone, clay, etc. The impactor is said to travel at the rate of 32 feet per minute while tamping. It can be operated in gutters and around manholes. Operates efficiently at below freezing temperatures. It is stated to provide 2200 1500 lb. impactions per minute, and uses only 3 gal. of gasoline for the entire day. The unit is powered by a Wisconsin gas engine and has rubber mountings throughout to minimize vibration. Timken bearings are standard. Comes equipped with high-grade rubber tires. Entire unit may be picked up and moved from job to job with ease. Wayer impactors are made in two models, No. 20 and No. 36. Model No. 20 is designed for medium-heavy jobs and weighs less than 200 lb. Model No. 36 is built for rugged use and handles heaviest requirements. Weight of complete unit is 387 lb.

16

New Tandem Roller

A new 3 to 5 ton tandem roller has been added to the line of Galion Iron Works & Mfg. Co., Galion, O. The company now manufactures four sizes of tandem rollers: 3 to 5 ton, 5 to 8 ton, 8 to 12 ton, and 10 to 14 ton sizes. All four sizes have the

"variable weight" feature which Galion pioneered in 1935. The 3 to 5 ton roller is of variable weight design, and has a metal weight of 7,120 lb. with the ballasted weight being 10,520 lb. Fully ballasted, the



Galion 3 to 5 Ton Tandem Roller

compression under the main roll is listed as 170 lb. per inch of roll width, and 85 lb. under the steering roll. The main compression roll is claimed to be of unusually large diameter for a roller of this size. Both rolls are fitted with front and rear scrapers and mats. A 50 gal. water tank, for sprinkling both rolls, is provided. All controls are within convenient reach of the operator. Automotive type steering permits easy operation. Forward and reverse motion is controlled by a single lever. Two speeds in each direction, controlled by two friction clutches. Powered by a 4-cylinder, air-cooled, 25 h.p. motor which is completely enclosed under the streamlined housing.

17
New Transit Mixer

A new 7 yd. transit mixer, the Tournamixer, capable of pouring concrete at a height of over 20 ft. has been added to the line of R. G. La Tourneau, Inc., Peoria, Ill. and Longview, Tex. The mixer operates at a selectively variable speed in either direction of rotation of the drum. This permits concrete to be thoroughly mixed while rotating in

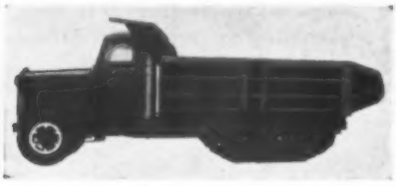
The Tournamixer

one direction, and to be forced out the discharge end, due to the corkscrew action of the blades, when rotated in the other direction. This method of control has done away with the need for a discharge door. The mixer is driven directly by its power plant which is located at the central or rotating axis of the drum. This type of drive is accomplished through the medium of a splined hub which is bolted to the drum and attached to the power unit by an internal spline which causes the drum to turn one revolution with each revolution of the power unit. The power unit itself consists of an electric motor and built in gear box, the driving spline of the gear box being substantially in line with the rotor of motor. The major components which comprise the complete Tournamixer are the main frame structure, swing frame structure, mixing drum, and the draft unit, a Tournapull. The transit mixer, fitted with large capacity pneumatic tires for high flotation and easy maneuverability, operates at road speeds varying in five separate gears up to about 15 m.p.h. The 7-yd. machine weighs in the neighborhood of 30,000 lb. and measures 9 ft. wide and approximately 45 ft. long.

18
New Model Linn Haftrack

Designed for heavy duty haulage, a new model Linn Haftrack has been placed on the market by Linn Manufacturing Co., New York, N. Y. The

new model incorporates the following basic design improvements: Full contour traction for maximum en-



New Model D-15 Linn Haftrack

gaged track area and increased stability, new long traction unit for greater load capacity and track area, higher speeds, either gasoline or diesel powered. Chassis standard . . . body styles available for contracting, oil drilling, cane hauling, mining, logging, snow removal and general industrial haulage.

MANUFACTURERS' LITERATURE

19
Motor Grader

The Rome 100 HP, 28,000 lb. motor grader is illustrated and described in a bulletin issued by Rome Grader and Machinery Division. The Union Fork and Hoe Co., Rome, N. Y. This grader has a 6-cylinder heavy duty diesel engine; 8-speed heavy duty transmission; finger-tip control hydraulic valves; no-creep hydraulic lifting mechanism; power clutches; power braking and power hydraulic steering. Nineteen outstanding advantages claimed for the grader are outlined in the bulletin. Specifications for the grader are included.

20
Engineering Instruments

A newly revised edition of the 50-page illustrated catalog describing the complete line of Gurley engineering instruments has been published by W. & L. E. Gurley of Troy, N. Y. The catalog includes detailed analyses of Gurley transits, engineers levels, precise leveling rods, alidades and topographic instruments and equipment. Hydraulic measuring instruments, water level recorders and indicators, field supplies and wind instruments are also discussed. Glass reticles, an exclusive Gurley development in surveying instrument design, replacing the platinum wire reticle, are illustrated and described as are other features of Gurley transits. Several reticle pattern designs are shown from parallel horizontal and vertical lines, combined with cross-lines for triangulation and stellar observation, to solar reticles for centering the sun's image.

21
Heavy-Duty Trucks

The FWD line of 6-wheel drive trucks is described in a circular published by the Four Wheel Drive Auto Co., Clintonville, Wis. The important features of these trucks are illustrated and described. The power proportioning differential, an exclusive FWD feature, is described.

22
Lubrication

Containing lubrication specifications for all 1946-1947 passenger cars and light trucks, as well as for several prior years, the first Alemite "Ex" Lubrication Prescription Manual issued since 1942 has been announced by the Alemite Division of Stewart-Warner Corporation, Chicago, Ill. An innovation is a chart of lubrication point locations for each vehicle covered.

23
Fill Settlement with Explosives

General principles of procedures in the use of explosives in the settling of fills on highway construction work are given in a 24-page book issued by Atlas Powder Co., Wilmington, Del. The book covers such subjects as: Cost of fill settlement with explosives; Methods of settling fills; Relief blasting at sides of fills; Loading before placing fill; and rules of thumb in fill settlement blasting. Numerous drawings illustrate the methods of placing explosives for various types of blasting.

24
Air Entrained Concrete

Darex air entraining agent is the subject of a bulletin just released by Dewey and Almy Chemical Co., Cambridge, Mass., what it is, how to work and how to use it are described. Advantages of "controlled air" to engineers and contractors are cited. Uses of Darex in highway, structural and mass concrete and ready-mixed are described. A method for redesigning air entraining concrete mixes in order to obtain the specified cement factor is given.

25
Admixture for Ready-Mixed Concrete

How Trimix, a multi-purpose liquid admixture, is used in the manufacture of ready-mixed concrete is described in a bulletin released by Building Products Division of L. Sonneborn Sons, Inc., New York, N. Y. Explaining that the admixture may be used in central-mixed, shrink-mixed and truck-mixed work with equal effectiveness, the bulletin describes how the use of this admixture contributes to finished concrete of greater density with increased resistance to wear, weather and chemicals.

26
Clamshell Bucket

The latest Hayward E-16 rehandling clamshell bucket is illustrated and described in a bulletin issued by The Hayward Co. New York, N. Y. The bulletin shows how the E-16 bucket can be adapted as well for excavating, mud work, dredging and other services. A valuable chart lists bucket load capacities, weights and dimensions in terms of various materials handled, together with figures on recommended wire rope diameters, reeving and closing lengths.

27
Installing Timber Connectors

Installing Teco timber connectors in light and heavy timber structures is described in a new publication issued by the Timber Engineering Co., Washington, D. C. Prepared particularly for the use of contractors and builders, the booklet illustrates and describes the installation of split rings and shear plates for wide span roof trusses and other heavy structures; and toothed rings for light, built in place structures where power is not available. For railroad construction, details are given for the use of clamping plates and spike grids for timber trestles. Trussed rafters for construction are featured along with Trip-L-Grip framing anchors. These rafters in spanning from wall to wall eliminate the cost of bearing partitions. The framing anchors are popular for framing rough openings.

28
Truck Bodies and Hoists

A new bulletin, No. KBH 647, has been issued by Kewanee Manufacturing Co., Kewanee, Ill., which illustrates and gives detailed specifications on the company's complete body and truck line.

29
Power Shovel Dippers

A new 40-page bulletin published by American Manganese Steel Division of American Brake Shoe Co., Chicago Heights, Ill., gives complete, detailed descriptions of all Amsco Dippers: the all-manganese steel welded type, the renewable lip type, and the Missabe type and other designs. Cross-sectional drawings and X-ray photographs highlight the outstanding design features. In addition to the dipper descriptions, this new bulletin demonstrates in detail how manganese steel parts solve maintenance and breakdown problems for power shovel and dragline operators. A section is devoted to a comprehensive discussion of austenitic manganese steel and its unusual properties.

30
Tournalayer Method of House Construction

An 8-page brochure, RT-126, titled "On-the-Site Monolithic Construction," published by R. G. Le Tourneau, Inc., Longview, Tex., portrays the new way of building homes by the Tournalayer methods. Prepared especially for large-scale contractors and operative builders, the booklet gives a complete description of how the Tournalayer operates and produces various combinations of basic, monolithic units in order to provide any size or style home. Numerous achitectural renderings illustrate the unlimited freedom of architectural treatment. An additional folder, RT-125, has also been prepared which gives a general view of the Le Tourneau method of home building. Contained in this review is material designed to answer the many technical questions asked about this method of construction by contractors and the public throughout the world.

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(*Continued from page 75*)

Air Entrainment Control Test Project Completed in Chicago

regular cement indicated, for the four samples tested, an average of 1.5% of entrained air, a slightly higher percentage than we usually obtained from concrete made with regular cement. Modulus of rupture tests made on specimens from the regular cement batches disclosed an average of 652 psi. for two 7-day specimens. Tests on the limited number of batches made

without an air entraining agent were performed primarily to eliminate the possibility of the cement companies having delivered air entraining cement instead of regular cement.

A comparison was made between the unit weight of the concrete without an air entraining agent, as determined by yield test with air entrained concrete in which the percentage of air was determined by our testing apparatus. On Oct. 7 at 11:50 a. m. an air determination test and a yield test were made from a specimen of concrete made with regular cement without air entraining agent. Air entrained was 0.5%. A yield test made of the concrete containing 0.5% of entrained air disclosed a unit weight of 152.8 per cu. ft. or 153.56 lb. equivalent for zero air entrained.

There was an average of 4% of entrained air in the concrete placed up to and including October 7. The average unit weight of the air entrained concrete placed to include October 7 was 147.5 lb. per cu. ft. If we compute the weight of concrete with 4% entrained air on a basis of 153.56 lb. without air the result would be 147.42 lb., in which substantial harmony with an average of 147.5 lb. determined by our tests.

Tests of both flexural and compressive strength were made on specimens obtained during the course of the job. The flexural tests were made on 6x6 beams, 30 in. long, applying a central load on a 16-in. span. Compression strengths were determined on 6 x 12 in. cylinders. The uniformity of strength may be judged from Table.

The use of Darex with regular Portland cement was found to be a satisfactory method for obtaining and controlling air content in pavement concrete well within the specification limits.

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(*Continued from page* 82)

All Eyes on California!

up for each county for each of three 5-year periods, starting July, 1947. A part of each county group's available construction funds for each period is to be "frozen." The guaranteed amounts are determined by applying percentages of this frozen money, based on each county's share of the highway deficiency program submitted by the state division of highways last winter. (The 10-year deficiency report shows total costs of $1,674,000 including $214,000,000 for metropolitan work.)

The state division of highways however will have considerable latitude in expending the money not

covered by the minimum guarantees.

The new law gives the state an estimated $46,431,000 more in the 1948-49 year than under the old law; will produce some $472,394,000 in new money for state highway purposes under 10 year period. $757,000,000 will be available for state highways in this period, including federal-aid for the first year only to be conservative.

WITH THE MANUFACTURERS & DISTRIBUTORS

Van Nest Promoted by Mack

J. G. Van Nest, who at 36 has 19 years of service with the Mack Truck Co. behind him, has recently been named assistant to O. L. Lear, purchasing agent at Mack's Allentown, Pa., plant. Mr. Van Nest joined Mack in 1928 as clerk in the purchasing department in its Plainfield, N. J., plant, and became successively buyer of finished materials and assistant to J. W. Rogers, Plainfield purchasing agent.

Made Assistant Sales Manager

Walter Carlson

Walter "Mike" Carlson has been appointed assistant sales manager of the truck body and hoist division of the Heil Co., Milwaukee, Wis. He started with the company in 1940 as a field service man for bodies and hoists, served three years in the Army Air Forces, and returned to body and hoist sales in 1946. He is well known to most Heil distributors and his background in field and service work will be helpful in working for their best interests.

New Distributor

The Mitchell-Kennedy Machinery Co., Inc., 110 South Third Ave., Phoenix, Ariz., has been organized as successor to the Mine & Smelter Co. The officers of the company are: President, Deane K. Mitchell, owner of the former Mine & Smelter Equipment Co., prior to which he was general sales manager of the Novo Engine Company, Lansing, Mich. Vice-president, Thomas W. Kennedy, who was a lieutenant colonel with the U. S. Army, Corps of Engineers in World War II. Prior to that he was associated with Taylor Tractor Co., and the Blake Equipment Co., of Columbus, O. The new company continue to engage in the sale and rental of construction, mining and milling machinery; parts will be stocked and mechanical service will be available.

Named Sales Rep.

J. Zimmerman

John Zimmerman has been appointed sales representative for truck bodies and hoists by the Heil Co., Milwaukee, Wis., in the states of Wisconsin, Michigan, Illinois, Indiana, Ohio and Kentucky. He has been with the Heil Co. for the past eight years. During the war years he was an expediter. Since then, he has been handling allocations of bodies and hoists for the sales department.

Jahn Opens New Sales Office

Announcement of the opening of new sales and executive offices at 1106 West 35th St., Chicago, was recently made by C. R. Jahn, president of the C. R. Jahn Company, Chicago, Ill., manufacturers of heavy-duty, low-bed trailers. Factory and accounting offices will remain at their present location in Savanna, Ill.

Personnel Changes by SKF

Three changes in personnel of district offices of SKF Industries, Inc., have been announced by R. R. Zisette, general sales manager of the ball and roller bearing firm. They include appointment of Roy C. Norton, Jr., as a field engineer in the Hartford, Conn., district office; the transfer of I. J. Torkelson, field engineer, from Chicago to the firm's branch at Milwaukee, and appointment of R. M. Parrish to the sales staff of the Portland, Ore., district office.

Ives Elected President Armco

S. R. Ives, vice president and general manager since March, 1945, has been elected president of Armco Drainage and Metal Products, Inc., Middletown, O. M. C. Patton has been elected executive vice president of this American Rolling Mill Co. subsidiary, and H. D. Neill, vice president in charge of sales. Ives and Patton have also been elected president, and executive vice president respectively of Armco Drainage and Metal Products of Canada, Ltd. Ives joined the company in 1917 as a foreman in the annealing department of the East Works plant. Patton's first connection with the company came in 1926 as an engineer with the Armco Culvert Manufacturer's

States Attack Parking Problem—A new survey by the National Highway Users Conference reveals that state legislatures have been taking three general lines of approach to the parking problems of their cities: (1) the further use of parking meters; (2) the setting up of municipal facilities to provide off-street parking, and (3) authorization of local investigations into the overall problem.

Michigan Marking 6,000 Miles of Highway—The State Highway Department of Michigan has started the most extensive pavement painting program in its history in an effort to reduce accidents. Some 6,000 miles of the most heavily traveled roads on the 9,400 mile trunkline system of the state are to be covered in the painting program this summer.

Association. Neill joined The American Rolling Mill Co. in 1926.

Appointed District Sales Manager

J. V. McKee has been appointed Southwestern District sales manager for New Holland Manufacturing Co., Mountville, Pa., which includes the states of Texas, New Mexico, Arkansas, Oklahoma, western Tennessee, Mississippi and Louisiana. Before becoming affiliated with the New Holland Manufacturing Co., McKee was connected with the Cleveland Pneumatic Tool Co.

Fricker Joins Heil

Don E. Fricker has been appointed assistant advertising manager for the Heil Co., Milwaukee, Wis. He was in charge of advertising for the LeRoi Co., Milwaukee, prior to his military service. He was in the army 31 months, spent 18 months overseas, did an outstanding job handling publicity for soldier shows in Italy.

S. W. Caywood Resigns

S. W. Caywood

Because of ill health, Stanley W. Caywood has resigned as president of International B. F. Goodrich Co. Mr. Caywood, one of the best known Americans in world export circles, recently completed 30 years of service with his company which he joined following his graduation from Baker and Columbia Universities. He was an officer in the American Expeditionary Forces in World War I.

Weaver New Wico Director

James R. Weaver, works manager of the East Springfield, Mass., Works, Westinghouse Electric Corporation, has been appointed a director of the Wico Electric Co., West Springfield, Mass.

New B-G Ad Manager

Barber-Greene Co., Aurora, Ill., has announced the appointment of Wayne D. Adamson as advertising manager. Mr. Adamson replaces John H. Dykstra, who is now associated with an advertising agency in Cleveland. Adamson was formerly with the Illinois Institute of Technology, where he was editor of several publications including the Illinois Tech Engineer.

Clark Joins Rosco

Harold C. Clark, head of the Road Machinery Division of Cleaver-Brooks Co., Milwaukee, Wis., joined the Rosco Manufacturing Company, Minneapolis, Minn., on July 15th. He will assist Thorman and Reuben Rosholt of the Rosco Manufacturing Co. and in this capacity will have complete charge of all sales east of the Mississippi River. Mr. Clark was associated with the Cleaver-Brooks Co. for twelve years; ten years as head of the Road Machinery Division.

CLEARING HOUSE

Inquiry Blank and Advertisers' Index

Check reference to advertisement or to items of equipment or materials on which you wish to receive information. Give your name and address in the space at foot of page (if convenient, please print or use typewriter), detach page and mail to ROADS AND STREETS, Readers' Service Department, 22 West Maple Street, Chicago 10, Ill. We will pass your inquiry along to manufacturers and see that you get desired information promptly.

Check below advertisements on which you wish information on products featured:

*Advertisers with * are represented in the 1947 edition of Powers Road and Street Catalog and Data Book. Please refer to it for additional information on any of their products.

Check other products below on which you wish us to obtain information for you:

AGGREGATE:
- ☐ Bins and Hoppers
- ☐ Conveyors
- ☐ Crushers
- ☐ Portable Plants
- ☐ Screens

BITUMINOUS:
- ☐ Batchers
- ☐ Finishers
- ☐ Distributors
- ☐ Dryers
- ☐ Heaters
- ☐ Plants (central)
- ☐ Plants (travel)

CONCRETE:
- ☐ Batchers
- ☐ Buggies and Carts
- ☐ Finishers
- ☐ Joints, Expansion and Contraction
- ☐ Reinforcement Accessories
- ☐ Metal Road Accessories
- ☐ Mixers (under 1 yd.)
- ☐ Mixers (1 yd. up)
- ☐ Pavers
- ☐ Reinforcing Steel
- ☐ Road Forms (1000' set)
- ☐ Tower
- ☐ Truck Mixers

CRANES:
- ☐ Crawler Mounted
- ☐ Truck Mounted
- ☐ Piledrivers

GRADERS:
- ☐ Blade, self propelled
- ☐ Blade, pull type
- ☐ Blade, under truck
- ☐ Elevating

LOADERS & TRENCHERS:
- ☐ Front-end loader (tractor mounted)
- ☐ Loader, bucket type and belt type
- ☐ Trencher or Ditcher

HAULING EQUIPMENT:
- ☐ Dump Trucks, self-powered
- ☐ Dump Wagons, tractor drawn
- ☐ Flatbed Trailers
- ☐ Other Trucks

PUMPS:
- ☐ Centrifugal
- ☐ Concrete
- ☐ Diaphragm
- ☐ Mud Jacking
- ☐ Piston
- ☐ Wellpoint

POWER UNIT: (Independent)
- ☐ Gasoline
- ☐ Diesel
- ☐ Electric

ROLLERS:
- ☐ Power (Smooth)
- ☐ Pneumatic Tire
- ☐ Sheepsfoot

TRACTORS:
- ☐ Crawler
- ☐ Rubber-Tired

TRACTOR EQUIPMENT:
- ☐ Dozers
- ☐ Power Control Units
- ☐ Rippers
- ☐ Scrapers, tractor drawn
- ☐ Scrapers, self-powered

BUCKETS:
- ☐ Clamshell
- ☐ Concrete
- ☐ Dragline
- ☐ Orange Peel

SHOVELS & DRAGLINES:
- ☐ Crawler (under 1 yd.)
- ☐ Crawler (1 yd. up)
- ☐ Truck Mounted

ROCK DRILLS & AIR TOOLS:
- ☐ Air Compressors
- ☐ Backfill Tampers
- ☐ Clay Diggers
- ☐ Concrete Vibrators
- ☐ Drills, cabel tool
- ☐ Drills, tripod and wagon
- ☐ Drills, rock, hand-held
- ☐ Paint Sprayers
- ☐ Paving Breakers
- ☐ Riveters and Chippers

MISCELLANEOUS:
- ☐ Buildings, portable
- ☐ Earth Drills, power
- ☐ Light Plants
- ☐ Lubrication, Service Truck
- ☐ Mowers, Highway
- ☐ Power Saws
- ☐ Soil Stabilizing Equipment
- ☐ Snowplows, rotary
- ☐ Snowplows, v or wing
- ☐ Spreaders, sand or cinders
- ☐ Street Flushers
- ☐ Street Sweepers
- ☐ Welders
- ☐ Cutting Torches
- ☐ Hydraulic Jacks
- ☐ Hydraulic Control Equipment
- ☐ Hand Tools
- ☐ Hoists, derrick type

Be sure to fill in name and address below:

Your Name.....Title or profession.....

Name of your company or governmental department.....

Type of work for which equipment will be used.....

Street Address.....

City ..... State ..... County .....

INDEX TO ADVERTISERS

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This is my WIRE ROPE REPLACEMENT RECORD

• There is a funny thing about using the longer-lasting LAY-SET Preformed Wire Rope. Not only do you buy wire rope less frequently (which saves money) but you probably get longer and better service from your sheaves and drums. That's because LAY-SET resists rotating, twisting and grinding as it bends. Because of that you don't have to re-tread sheave or drum grooves as often. There, of course, cutting down on the frequency of rope replacement means less-interrupted, steadier machine production, and Mister, that *really* is important. Specify Hazard LAY-SET Preformed of Improved Plow Steel.

ACCO Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, Portland, San Francisco, Tacoma, Seattle, Bridgeport, Conn.

HAZARD WIRE ROPE DIVISION
AMERICAN CHAIN & CABLE

HAZARD WIRE ROPE 101 YEARS OLD 1846 • 1947

TRADE MARK

In Business for Your Safety

SURE cure for a drill's "ills" – drill doctors say – is *effective lubrication*. Use Texaco Rock Drill Lubricants (E.P.), and your drills will stay in peak condition longer, require less servicing, cut greater footage at lower cost.

Texaco Rock Drill Lubricants (E.P.) have "extreme pressure" characteristics – give all moving parts full protection against wear. They resist oxidation, always flow readily, prevent rust and corrosion whether drills are running or idle.

Leading rock drill manufacturers approve Texaco Rock Drill Lubricants (E.P.) because they meet the lubrication requirements of every type of drill design and operating condition.

For Texaco Products and Lubrication Engineering Service, call the nearest of the more than 2500 Texaco distributing plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, New York.

PROTECT COMPRESSORS, TOO! Get more efficient, economical compressor operation by lubricating with the recommended *Texaco Alcaid, Algol or Ursa Oil*. All these famous oils prevent hard carbon formations — keep rings free, valves active, ports and air lines clear. Use them to keep pressure up, costs down.

TEXACO

TEXACO Rock Drill Lubricants (E.P.)

Tune in . . . TEXACO STAR THEATRE presents the TONY MARTIN SHOW every Sunday night. See newspaper for time and station.